DEC 1 ... OF MICH...

VOL. LXXXI, No. 2085. [All Rights Reserved.] NOVEMBER 9, 1917. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage.] PRICE FOURPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C.4 SUBSCRIPTION per annum. Postage inclusive, in Great Britain, £1 1s. 8d. Canada, £1 3s. 10d. ($5.80); to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOYVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
Telegraphic Address: "Ageekay, Cent., London." A B C Code. Telephone Nos. City 997; Central 4425 (Editorial only).

LITHOLITE, Ltd.,
55—57, Hackney Grove, London, E. 8.
'Phone and Telegrams: Dalston 592, London.
MANUFACTURERS OF
MOULDED INSULATORS,
FIREPROOF AND OTHER GRADES.
ESTABLISHED NEARLY 20 YEARS.

AIR COMPRESSORS & VAC. PUMPS, Desiccators Sets. NORMAN DICKSON, PRINGLE & CO. Cable Pumps & Impregnators.
25, Victoria St., Westminster.

WIRES.
THE GENERAL CABLE MANUFACTURING CO., LTD.,
Imperial House, Kingsway, London, W.C.
Phone: Regent 5781.
CABLES.

EVERY DESCRIPTION OF
SMALL TURNED PARTS and CASTINGS for ELECTRICAL ENGINEERS.
A. MORTON,
6, Tenby Street North, Birmingham.

BROOK
Single-, Two- and Three-Phase Motors
LONDON, LEEDS and HUDDERSFIELD.
See Advertisement Sup. 88.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors,
GREENLAND PLACE, CAMDEN TOWN, LONDON.

TAYLOR & CO.
MICA & MICANITE
Speciality:—Plates for high resistance.
Telephone:—CENTRAL 4575.
40, HATTON GARDEN, LONDON, E.C.

Osram, Mazda, Wotan, "Z" and other Conference Lamps. Pocket Lamps, Torches, Batteries, &c.
E. DAWSON & CO. (LTD.) E. POTT.
24, GRAY'S INN ROAD, London, W.C.1
Telephone: HOLBORN 2784.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

LIFTS and - - - - TRANSPORTERS.
Wm. WADSWORTH & SONS, LTD.
BOLTON.

"EMPIRE" AUTOMATIC CONTROL
FOR
Shell Presses, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C.
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement last week, p. xxiv.

CONNOLLY BROS., Ltd.,
for
WIRES AND CABLES.
See Advertisement this week, p. iii.

WHITE
Electrical Instrument Co.
2, 4, & 6, GLOUCESTER ST., CLERKENWELL, LONDON, E.C.
Wire: Volsograph, London. 'Phone: City, 8060.

LANGDON-DAVIES
ELECTRIC MOTORS
One, Two and Three-Phase.
LANGDON-DAVIES MOTOR CO.,
110, Cannon Street, London, E.C.

INSULATING - - BEADS - -
Immediate Delivery.
HOLDER-HARRIDEN LTD., 35|37, Noble St., London, E.C.

CABLES AND WIRES. SWITCHBOARDS. TRANSFORMERS.
JOHNSON & PHILLIPS, LTD.,
CHARLTON, LONDON, S.E.

Better than Rubber, Leather and Gutta-Percha.
PUMP VALVES
DERMATINE
DERMATINE CO., Ltd.,
Neate St., London, S.E. 5

LARGE STOCK KEPT FOR QUICK DELIVERY
SHUNT REGULATORS,
MOTOR STARTERS and all classes of Resistance Work.
The SOLENOID REGULATOR Co. (GEORGE A. YARWOOD Proprietor),
HIGHGATE SQUARE, CAMP HILL,
Telephone: Midland 538. BIRMINGHAM Telegrams: "Solenoid, Birmingham."

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

ELECTRIC MOTOR REPAIRS
ARMATURES REWOUND.
H. DUNN & SON,
Newington Causeway,
Tel.: HOP 1167. LONDON, S.E. 1

THERMIT, LIMITED,
675, COMMERCIAL ROAD,
'Phone EAST 4157. LONDON, E. 14 Grams. "Fulmen Stap, London"
PATENT
Alumino Thermic Welding Process.

START LIGHT.
THE
WOODHOUSE AUTOMATIC CLUTCH
PICKS UP LOAD AFTER STARTING.
THE VICTORIA DYNAMO & MOTOR CO.,
CRAVEN HOUSE, KINGSWAY, W.C. 2

INGLEBY & CO., LTD.
ELLAND ROAD, LEEDS.
MOTORS FOR DIRECT AND ALTERNATING CURRENT
Tel. 378
Delivery from Stock up to 50 H.P.

Advertisement Index, see page xxviii.

ENGLISH EDISWAN EVERYTHING ELECTRICAL

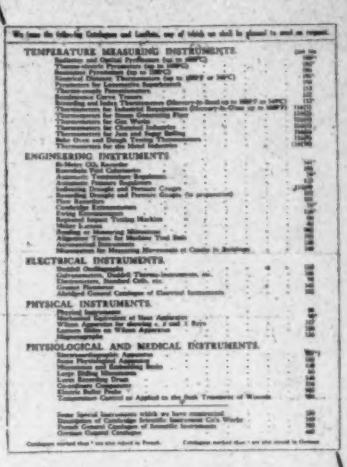
The house of Ediswan is the best equipped to deal with all enquiries for

Everything Electrical.

ENTIRELY BRITISH.

The Edison Swan Electric Co., Ltd.
PONDERS END, MIDDLESEX.
London and Provincial Depots.

WRITE FOR COPIES OF ANY OF OUR CATALOGUES WHICH INTEREST YOU.



THE
CAMBRIDGE SCIENTIFIC INSTRUMENT CO., LTD.,
CAMBRIDGE, ENGLAND.

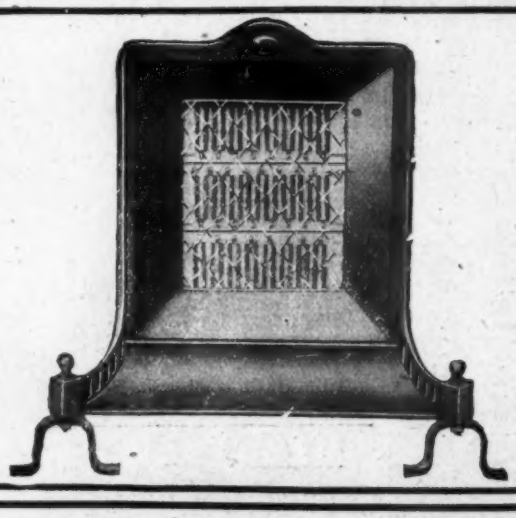
ARMATURES REWOUND.

DYNAMOS AND MOTORS REPAIRED.

CONTRACTORS TO MUNITION WORKS, CORPORATIONS, INSURANCE COMPANIES, &c.

'Phone: 4109 Central.
Telegrams: Ohmic, Manchester.

AUSTIN WALTERS & SON, GAYTHORN, MANCHESTER.



THE
ARORA ELECTRIC FIRE

Has given universal satisfaction.

Low Price, Robust, Cheery, Economical.

WHY? Because OUR patented Element is of HEAVY SECTION and has LOW Current Density, yet it GLOWS at a HIGH TEMPERATURE.

Write for List E (Fires & Cookers) to Sole Manufacturers:

THE ARORA CO., Loughborough.
(Proprietors: Messenger & Co., Ltd.)

VULCANISED FIBRE.

DIAMOND FIBRE TRADE MARK

In Sheets, Rods, Tubes, and Special Shapes.
Horn Fibre, Diamond Insulation, Press Board, Fuller Board, &c.

DIAMOND STATE FIBRE CO., 57, OLD ST., LONDON E.C.

VOL. L

Vol. LXX

Co-operati
The Engin
Research
British St
Associatio
South A
The Engin
Temperatu
(*illus.*)
Correspon
The
The
A Gr
Cir
Portable
Business
Notes
City Note
Stocks an
Market Q
The Rho
Set (*ill*
German
Legal
War Item
New Pate
Abstracts
Contracto

THE

Th

TO BE

OFF

The "El
by far th

Subscr
£1 1s. 8d.

ADELAIDE
Gresham

AUCKLAND
Albert
Enginee
Arcade,

BRISBANE

CHRISTCH
Gotch,

DUNEDIN,
Princes

JOHANNES
FONTEIN
BETH,
Ltd.

LAUNCE
Cimitie

Cheque

THE EL
Newgate

ELECT

H. A

THE

ELECTRICAL REVIEW.

VOL. LXXXI. NOVEMBER 9, 1917. No. 2,085.

ELECTRICAL REVIEW.

Vol. LXXXI.] CONTENTS: November 9, 1917. [No. 2,085.

	Page
Co-operative Trade Abroad	433
The Engineer and Agriculture	434
Research Organisation, by D. R. Kennedy	435
British Standards for Electrical Machinery	436
Association of Municipal Electrical Engineers (Union of South Africa) (*illus.*)	437
The Engineer and Agriculture	439
Temperature Control System in the Charing Cross Hospital (*illus.*)	440
Correspondence—	
The E.T.U. or the A.E.S.E.?	441
The Teaching of "Electrical Installation Work" ...	442
A Graphic Method of Calculating the Resistance of Two Circuits in Parallel (*illus.*)	442
Portable Electric Lamp Cooking Box (*illus.*)	443
Business Notes	443
Notes	446
City Notes	450
Stocks and Shares	451
Market Quotations	451
The Rhodes-Firth Combined Lighting and Engine-Starting Set (*illus.*)	453
German Economic Organisation	454
Legal	455
War Items	455
New Patents Applied for, 1917	456
Abstracts of Published Specifications	456
Contractors' Column ... ... Advertisement page	xxii

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE: 4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGENTRAY, LONDON." Code, A B C.

Telephone Nos.: City 997; Central 4636 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, £1 1s. 8d.; Canada, £1 3s. 10d. ($5.80). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson, & Co., Gresham Street.

AUCKLAND N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 31a, Strand Arcade, Queen Street.

BRISBANE: Gordon & Gotch, Queen St.

CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.

DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.

JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.

LAUNCESTON: Gordon & Gotch, Cimitiere Street.

MELBOURNE: The Mining & Engineering Review, 90, William Street; Gordon & Gotch, Queen Street.

MILAN: Fratelli Treves.

NEW YORK: D. Van Nostrand, 25, Park Place.

PARIS: Boyveau & Chevillet, 22, Rue de la Banque.

PERTH, W.A.: Gordon & Gotch, William Street.

ROME: Loescher & Co., Corso Umberto 1° 307.

SYDNEY: The Mining & Engineering Review, 278, George Street; Gordon and Gotch, Pitt Street.

TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.

WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

THE "ELECTRICAL REVIEW'S"

ELECTRICAL & ALLIED TRADES DIRECTORY

(THE RED BOOK),

1917 EDITION.

H. ALABASTER, GATEHOUSE & KEMPE,

4, Ludgate Hill, London, E.C. 4.

CO-OPERATIVE TRADE ABROAD.

WE have on several occasions referred to the inquiry that was made a short time ago by the American Federal Trade Commission into the subject of co-operation in the American export trade. Some of the evidence given was distinctly interesting from the electrical standpoint, inasmuch as it set out somewhat fully the measures taken by present enemy industrial organisations for working their way into foreign markets by fair means or by foul. It will be remembered that the anti-trust legislation of the States was held to bar the way to co-operative action by American manufacturers in such a matter. It is hardly likely that this handicap will be allowed long to continue, and proposals for removing it have, we believe, already exercised the minds of American legislators. A complete copy of the report of the Commission is now in possession of the British Department of Commercial Intelligence, and we have no doubt that our electrical manufacturers and those representing their organised associations will find it politic to study the document.

It is recognised that the United States is becoming less and less an agricultural country, and more and more an industrial one, and in order to be prepared to take a larger place in industrial exportation it is necessary that the world situation, and the organised and other practices of other exporting peoples, should be comprehensively studied. This is done in detail in the report. The competitive conditions as they have prevailed in the past, and up against which American traders have found themselves, are examined, and naturally a good deal of attention is devoted to the German Cartels, and the big financial and industrial organisations of Germany and other countries which are found to have assisted their efforts to secure foreign trade receive a good deal of attention. Not without special reason the competitive conditions in South American trade, vast potential markets for decades to come, where German influence, once fostered with such characteristic measures of "penetration," is now on the wane, and where naturally the United States' traders hope for greater things than have been hitherto experienced, have, of course, not been overlooked. But the report goes further than this, for it deals with a number of special industries individually, and discusses the operations of foreign combinations established by them, and the possibility of forming American export combinations to assist these particular industries. Among these specialised lines are electrical manufactures, machinery and rolling stock, blast furnace and rolling-mill products, chemicals, textiles, and so forth. The principal conclusion that is arrived at seems to be that legislative measures must be passed clearing away effectively the present doubts concerning the legality of co-operation abroad on the part of American firms. When this has been effected, it is believed, American exporters will be enabled to compete in foreign markets on more nearly equal terms with foreign competitors.

There is no reason to doubt that after the war the States will be a larger sharer in the export business of the world. For some years undoubtedly there will be ample room for us all, so immense is the mountain of arrears that is accumulating everywhere, and so vast will be the needs for reconstruction or rehabilitation, but we all recognise that a great change has come over the face of industrial manufacturing throughout the entire world. That

being so, we hope that the conclusions of the American Federal Commission, made after so complete a study of the whole subject, in favour of co-operative action will be regarded as an additional signpost for the attention of the British manufacturer. The disposition among our firms to come together, consolidating scattered smaller forces, unifying, and thus making more economical and efficient, their selling organisations, is a very satisfactory feature of the industry to-day. Such measures are necessary in order that our means may be in readiness for immediate operation directly the more propitious times are upon us. We publish on another page to-day some information concerning consolidation efforts made during the war in Germany, though we know that there has been a strong feeling among traders in some departments of industry there is opposition to the movement. Yet we must recognise such consolidation as an accomplished fact, and that these organisations will endeavour for all they are worth, probably with some of the familiar methods of the past, and with others which they consider more suited to enable them to surmount the difficulties consequent upon the antipathy of the greater part of the world, to secure a position of strength. As manufacturing peoples, no doubt they will have their place to fill in world economy. What is needed is that, while there is time, British manufacturers shall take far-sighted action to secure their own position when they come up against the organisations of other countries. Representatives of our Department of Commercial Intelligence have spoken with no uncertain voice on the subject at recently-held meetings at Birmingham, and on Tuesday last at the Engineers' Club at Manchester. We do not know how they could conscientiously do otherwise in presence of all the information that is in their possession in American and German reports.

The merchants have uttered protests, but possibly they have not had an opportunity of considering the facts of this important changing world situation. As we have said before, they will still have their own place to fill as importers and exporters; for many things they cannot be dispensed with now any more than in the past, but they must recognise that with the shaping of new industrial policy, the merchant interest cannot prevent the crying necessity for manufacturers to adopt large specialised measures for bringing into British manufacturing works the business that the world has to offer. Much of such trade, in the engineering world at any rate, may fall away from us if the manufacturer who knows his goods and can best approach his technical buyer is to restrict his co-operative or combination efforts in order to allow the merchants too free a field for action. We have no desire to question the patriotism of merchants as a class—they have done vast good for British trade; but we must not shut our eyes to the changes that have overcome, and are overcoming, industrial affairs in practically all countries. If the merchant were to become as purely British as he can be, and were to act in co-operation with the manufacturers in some way, we do not see why advantage should not be taken of his lengthy and specialised experience of the world markets. Is it impossible for these two valuable forces to run in harness for the industrial benefit of the nation, assisting the nation back to prosperity, and finding work for millions?

The manufacturers in the future will undoubtedly be out to get business for themselves far more than they have been in the past, and, if the Government sees that the world-wide co-operative movement is the right way in which they can be better prepared effectively to meet the coming situation, we do not see why its spokesmen should not say so emphatically, and at so important a British manufacturing centre as Birmingham. Were they to remain silent in the presence of so many very clear signs on their horizon, they would merit the condemnation of industry, however much they received the commendation of the merchant. Is the duty of the Government trade representatives to be limited to the collection of information, and are they to be precluded from drawing inferences from that information? Heaven forbid! We have preached co-operative effort in these pages too long to regard the Government policy as a mistake. Our counsel has rested upon a good foundation, as present-day movements fully prove. Objections based upon personal and selfish interests, legitimate as those interests are in business, will hardly carry weight with a Government which is laying its plans for future prosperity, any more than they do with us.

The Engineer and Agriculture.

The recent report of the Sub-Committee of the Conjoint Board of Scientific Societies on the application of Science to Agriculture is a most welcome indication of the extended interest which is being taken in this very important subject. It may be remembered that the Conjoint Board of Scientific Societies was formed last year at the instance of the Council of the Royal Society, mainly with a view to promoting the application of science to industry; its membership includes representatives of 27 prominent societies, which the President of the Royal Society as *ex officio* Chairman. Needless to add, it is a matter for congratulation that amongst the very numerous matters which might claim the attention of the Board, the pressing—nay, vital necessity of reorganising British agricultural methods on scientific lines, has received immediate attention.

The Sub-Committee was constituted specifically "to inquire into and report upon the work at present in progress on the application of science to agriculture, and to make such recommendations as they think fit, with a view to promoting the application of engineering to this subject," and its report, which we reprint elsewhere in our pages, will make pleasant reading for electrical engineers. It is noteworthy that the report is apparently the work of an engineering sub-committee, comprising Sir John Snell, Messrs. A. E. L. Chorlton, F. S. Courtney, and J. Nugent Harris, appointed by the parent Sub-Committee.

The Sub-Committee found—as we ourselves and others have also done—that certain fundamental data were lacking, and "that there appeared to be no Government Department or organisation which possessed this information"; but with the assistance of the Agricultural Organisation Society, it is now in a fair way to secure "valuable data on which to build practical estimates of the power required and costs of operation, and to compare the relative advantages and costs of steam or internal combustion machines and electrically-operated machines." The Sub-Committee states its emphatic belief in the great future which awaits the development of electrical applications to agriculture in this country; its belief that electric power can be distributed to farms at prices which would pay the farmer; its appreciation of the simplicity of electric propulsion for ploughing and other operations, and of utilising a form of power whose source does not involve importation of fuel, &c. The subject of electroculture receives a passing reference, and, finally, it is recommended that an electric tractor, and possibly other agricultural machines, should be designed, constructed, and tested by experienced agricultural and electrical engineers; to this end the Conjoint Board last month unanimously recommended the Board of Agriculture to grant the necessary funds, and to appoint its Agricultural Sub-Committee as an Executive Committee to superintend the work. So

much for the report, the findings of which amply confirm opinions expressed by ourselves in these columns during the past few years, and are the more interesting because the Sub-Committee is representative of "engineering" as distinguished from electricity supply.

An independent and essentially advisory body such as the Conjoint Board of Scientific Societies can render inestimable service in shaping the future of British agriculture along economic lines. With all due respect to our agricultural experts, it is abundantly evident that the basic question of making the land produce the nation's food at the cheapest possible cost has still to be answered, and the general policy to be pursued in regard thereto to be defined. This this may involve a complete transformation of agricultural methods is a foregone conclusion, for if farming is to be no more a hobby, as in the past, but is to become in truth the master-key industry that it should be, then the co-operation of the engineer, the chemist, and the business organiser will be indispensable, efficiency will necessarily be the order of the day, and efficiency means machinery and, if necessary, methods adapted to the use of machinery, instead of the reverse. A general survey and pronouncement on the primary factors essential to the development of our agricultural industry to meet the needs of the nation is badly needed, and would lay the foundation for successful progress; and, having in view the necessarily scientific nature of such development, it appears to us that the Conjoint Board, with its independent standing, could well undertake this work, which would in effect co-ordinate the various efforts towards the industrial reconstruction of agriculture.

The problem is no mean one; it amounts roughly to the trebling—if that be possible—of the output of our farms with the minimum of additional labour, and, of course, presupposes the use of machinery wherever possible. It is mainly an engineering problem.

RESEARCH ORGANISATION.

By D. ROSS KENNEDY.

. . . There seems to be room in the industrial world for three methods of financing research. There is research which the individual firm finds it remunerative to undertake at its own expense. Secondly, there is research which is financed on a co-operative basis; and, lastly, there is research which must be financed by the State if it is to be done at all.

Is any distinction in kind to be drawn between these three classes of research which would justify this difference of treatment? (Page 16.)

We have given considerable thought during this year to the question of encouraging inventors. The problem is undoubtedly one of great importance, but it is also one of great difficulty. (Page 42.)

(Report of the Advisory Council on Scientific and Industrial Research, 1916-17.)

For the answer to the question in the first quotation, the Advisory Council has sought in the correct direction, and concludes that the third class is to be identified by the fundamental character of its results; and, in keeping with the general tenor of the report, it is fundamental scientific research which is to be so distinguished.

But if *practical research* be substituted for scientific research, then a much more appropriate distinction will be provided, and, at the same time, a solution will be given to the difficult problem in the second quotation. Practical research is the one which should form the third class, and is one which requires State aid to a far greater degree than any other class of research work.

The neglect of practical research in the proposed research organisation is to be explained by the fact that the organisers believe that

It has been the co-operation of progressive industry with science which has led to the practical application of the results obtained in the laboratories of scientific men.

This is not the case; at least, not in the engineering industry, where the practical application of the results of scientific research is due to practical research, which forms the true link between science and industry.

When the scientific research has been successfully accomplished, it still remains to devise means whereby the results of the investigation may be usefully employed for the benefit of civilisation, and so the inventor takes up the task, and by means of practical research guides the issue of scientific research into a channel of industrial utility. And it is by practical research that the industrial design of an invention is evolved and the lines are indicated along which the industrial production must proceed to be commercially efficient. Before "progressive industry" will consider the merits of an invention, in a great many cases the inventor has to carry through this work.

The Trade Research Associations advocated in the Report will be of very little help to the individual inventor. Large engineering establishments have, as a rule, inventors on their staffs, and although facilities exist for conducting practical research to the highest degree, these are, unfortunately, utilised on a small scale only for improvements in design. Manufacturers have the reputation, and not without cause, of discouraging inventors with fundamental revolutionary ideas. There is some reason, however, for this reactionary attitude from the point of view of the manufacturer who has sunk large sums of money in the development and production of a standard article, which to a great extent would be lost if drastic changes were effected.

There is little need to enumerate the many engineering inventions which have helped to build up our civilisation, and which were due to the tenacity of purpose of a private inventor struggling against adverse circumstances of a nature quite apart from the problems of practical research, on which his every effort should have been concentrated. Having proved the worth of his invention, the inventor sinks into obscurity, whilst the organisers of industry reap the benefit. On the other hand, successful workers in scientific research have their labours amply rewarded, and their fame lives for ever in the text-books.

Scientific research has always been the child of fortune, reared in the elaborate laboratory of an educational institution; its development carefully fostered by indulgent professors, free from mental distractions caused by financial embarrassments, and with numerous assistants paying for the honour of participating in the work. And now scientific research is provided with an affluent State apartment, wears a massive gold albert, and has industry for its valet.

Practical research has never been a favourite in the educational institution—due, no doubt, to the fact that practical experience and technical skill are necessary to its development. The garret, cellar, or outhouse has been its normal environment, and it has only enjoyed spasmodic opulence when adopted by wealthy experimenters or inventors with adequate financial support, exceptions which only go to prove to what extent the inherent strength of practical research could be developed if it enjoyed the same, or even a part of the, prosperity that is thrust upon scientific research.

If the private inventor is still to struggle on with the scope for practical research restricted, and its growth stunted for lack of suitable nourishment, then the period which elapses between successful scientific research and its practical application to industry will still be unnecessarily prolonged. Instances could be multiplied where well-known present-day productions of the engineering industry have been years in the process of practical research, whereas if similar facilities had existed as for scientific research their beneficial effects would have been enjoyed much earlier.

Is the internal-combustion turbine to languish for years like the steam turbine, until the accidental advent of an inventor possessed of the rare combination of engineering genius, independent financial means, and enthusiasm for work, proves its practicability?

If less time be lost between the completion of the scientific investigation and the ultimate development of an industrial production through practical research, then, instead of labour waiting on industry, industry would be seeking labour, wherein lies the solution of some perplexing problems facing labour and finance.

In the light of an experience of upwards of ten years in practical research work, electrical and mechanical, the suggestion cannot be accepted that the industrial research for

which facilities are being provided is synonymous with practical research. Truly, on page 43 of the Report, an indirect reference is made to practical research :—

In suitable cases the Department are also prepared to consider applications for assistance towards researches necessary to perfect for commercial use patented or protected inventions or processes.

But where is the organisation necessary for efficiently applying the assistance?

To the practical research worker, the experimental workshop is the equivalent to the scientific research-worker's laboratory. Scientific laboratories abound throughout the country. The organisation for practical research should provide for the establishment of experimental workshops in suitable centres. Where training workshops exist in technical colleges and universities, they should be thrown open to the practical research worker, and organised as much for his benefit as for the scholars'. The worker in practical research would then enjoy the same opportunities as the professors, and could command free assistance from students, whilst the practical experience the students would obtain would be a valuable addition to their technical training.

The organisation of experimental workshops would also require to include paid assistance, and for this purpose it would not be feasible to employ the staff which has been organised for scientific research. It is only in exceptional cases that scientific abilities are combined with engineering skill. The ability to produce scientific research of a high character is seldom accompanied by the training, skill, and engineering insight, coupled with genius for design, which successful practical research calls for.

The investigator who works alone on practical research must be highly accomplished in the mechanical arts. He must have the combined experience of the designer, pattern maker, turner, fitter, and tester, and he must also have experience in adapting existing material to the construction of apparatus for making preliminary tests, and be capable of appreciating the results of these tests. The scheme for scientific research indicates that provision is to be made to include the worker in the organisation, but, from the above, it will be seen that practical research affords the better opportunities for the co-operation of skilled labour. The skilled workman can understand and appreciate practical investigation, but how would a worker, say, with experience in constructing electric generators, participate beneficially in the scientific investigation of the hysteresis loss in magnetic material and the determination of the magnetisation curves? On the other hand, the co-operation of this worker would be invaluable in practical research work such as is necessary to develop, say, the homopolar electric generator. In the organisation of the experimental workshop the necessary skilled labour would be included as paid assistance.

In addition to financial assistance and the establishment of experimental workshops, a central technical advisory office is essential to practical research organisation. Many inventions are delayed in development, and others lost altogether, through the inventor's lack of technical training, and often the practical research fails for want of correct design. A properly organised technical advisory office would afford assistance in the necessary calculations and design for experimental models, and thus, in many cases, relieve practical research from the burden of an injurious handicap.

When the organisation of the present scheme is extended to include some such organisation for practical research as outlined above, then the results of scientific investigation will be systematically analysed and tested for their industrial destination with a minimum of delay, and then organised research will achieve its object and its innovation be justified.

BRITISH STANDARDS FOR ELECTRICAL MACHINERY.

The revised "British Standardisation Rules for Electrical Machinery" (excluding motors for traction purposes), No. 72—1917, issued by the British Engineering Standards Committee, and dated September, 1917, present several interesting departures from what has been the Committee's standard practice. The new format of the rules—octavo, printed on both sides of the paper—will at once commend itself to those who have occasion to consult its pages, whose numbers, moreover, will be greatly increased by the welcome reduction of the price from 10s. 6d. to 1s., made possible by the Government contribution to the funds of the Committee. The announcements that all the specifications will in future be issued in this form and at this price, and that translations into foreign languages will shortly be ready for issue, are also very satisfactory, and bear witness to the progressive spirit by which the Committee is animated.

In our issues of December 10th and 24th, 1915, we reviewed at some length the specification No. 72 dated October, 1915, of which the present issue is the first revision. We, therefore, need only refer to the changes which have been made, as the result of a conference with the Standards Committee of the American Institute of Electrical Engineers in March, 1916, at which the British Committee was represented by Mr. le Maistre, the secretary.

An introduction has been provided setting forth the object of the Rules and explaining their use, and the Appendix giving instructions as to the information that should be furnished when inquiring about or ordering electrical machines has been made Section I.

The standard pressures for motors are now placed with the standard frequency and phases in Section III, and include 460 volts. The "types" of generators and motors have been revised, "open" being replaced by "open pedestal" and "open end-bracket," "protected" being more fully defined, and "enclosed ventilated" being substituted for "semi-enclosed," while the maximum area of the apertures in the perforated covers is increased from $\frac{1}{4}$ to $\frac{1}{2}$ sq. in. The next noteworthy alteration is the permission (Clause 68, formerly Clause 57) to ascertain the temperature of shunt or separately-excited field coils by thermometer if it can be shown that the temperature as determined by the resistance method would not have exceeded the permissible limit—subject, as before, to a penalty of 5° C. A large part of Section IX (now Section X) dealing with the use of embedded temperature detectors is cut out, without materially affecting the requirements.

Considerable changes have been made in Section XIII on "Excess Current and Torque Tests" (formerly Section XII, "Tests for Mechanical Strength and Stalling Torque"). The excess current test for machines with "continuous" rating is reduced from 100 to 50 per cent. The stalling-torque test for induction motors so rated is not to apply to machines of abnormally low speeds or high frequencies, and consequently low power factor. Shunt motors for intermittent service are exempted from the requirement that they shall exert a starting torque on test 100 per cent. in excess of the value corresponding to their rating.

The table of high-pressure tests on dielectrics has been radically amended; all machines above 1 H.P. are to be tested with twice rated pressure + 1,000 volts. For separately excited rotating field windings the maximum test pressure is fixed at 3,500 volts. A special test (Clause 96) is prescribed for a machine which has been out of service for some time—namely, 75 per cent. of the pressure applied to a new machine. Current and pressure transformers are omitted from the table, being covered in another Specification. The stipulation that the insulation resistance shall not be less than 1 megohm is removed. The complicated alternative "Duration of High-Pressure Test" (old Clause 83) has been dropped, leaving one minute's electrification as the only standard; old Clause 84, relating to "Discharge During Test," has also gone.

A new item to be stated on the rating plate of an induction motor is the rotor current.

We may add that in many places verbal alterations have been made, which clarify the style without affecting the sense of the text. It is interesting to note that the rather ugly I.E.C. symbol for kilowatt (kW) employed in the previous edition has been replaced by the form KW. As a whole, the new style of specification represents a very marked improvement on its predecessors, which, owing to the mode of binding, the large pages, and the comparatively enormous bulk and weight, were by no means convenient to handle. The new edition weighs 3¼ oz.—the old one, 17 oz.

ASSOCIATION OF MUNICIPAL ELECTRICAL ENGINEERS (UNION OF SOUTH AFRICA).

The second annual Convention of the Association of Municipal Electrical Engineers (Union of South Africa) was held at Durban from August 27th to September 1st, and was attended by members and Councillors from the various parts of the Union.

An official welcome was given to the Association on the opening day by the Mayor of Durban, after which the annual general meeting was held for the election of officers and the transaction of business.

Mr. John Roberts (Durban) was elected president, and Mr. B. Sankey (Port Elizabeth) vice-president.

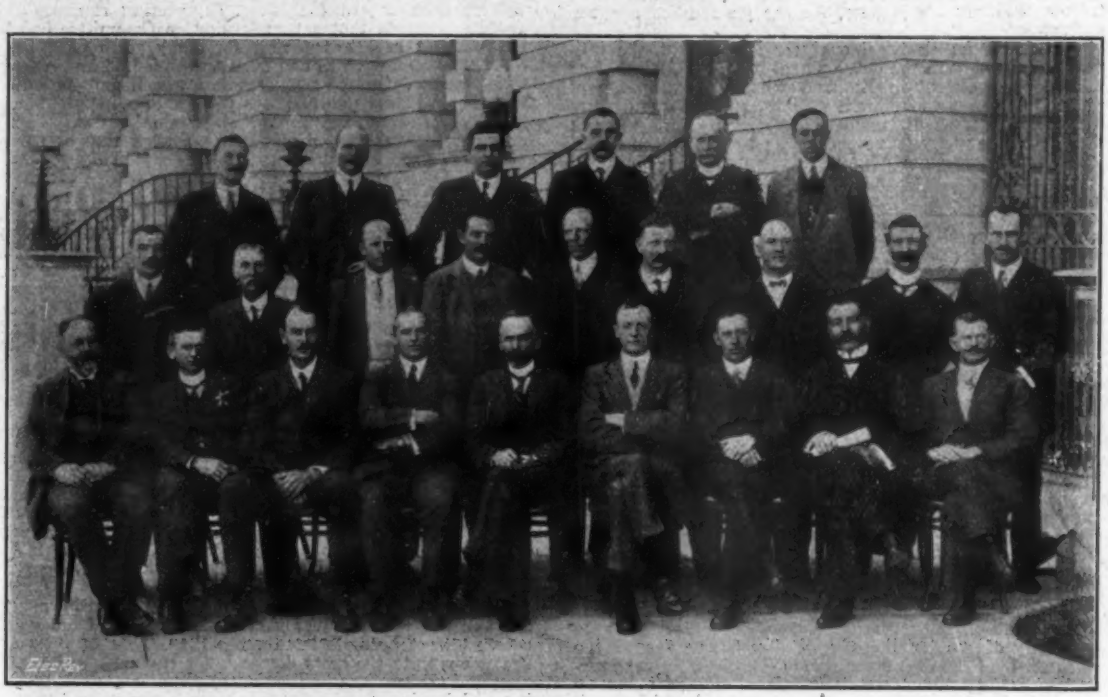
The members of Council elected were:—Col. Dobson, D.S.O. (Johannesburg), past president; Mr. T. Wolley-Dodd (Pretoria), Mr. W. Bellad-Ellis (Queenstown), Mr. T. Jagger (Ladysmith), and Mr. G. A. Stewart (Bloemfontein).

On Wednesday a visit was paid to Pietermaritzburg, where, at the invitation of the Mayor, members were entertained to lunch. A very interesting lecture was given during the day by Mr. J. W. Kirkland, of Johannesburg, on "Railway Electrification"; the basis of the lecture was the Chicago, Milwaukee and St. Paul Railway of America, the aim of the lecture being to show how electrification could be advantageously adopted in South Africa.

On Thursday a paper on "Standardisation" was read by Mr. John Roberts, and the discussion led to some important recommendations being arrived at for submission to the South African Standards Committee now sitting in Johannesburg.

In the evening, on the invitation of the engineering section of the Natal Society for the Advancement of Science and Art, the members of the Convention attended the first annual dinner of that society, and there were about one hundred present.

On Friday further discussion took place on "Tariffs,"



A. S. Munro (Pietermaritzburg). R. A. Stoker (Kroonstad). G. H. Swingler Cape Town). C. J. Everatt (Johannesburg). Councillor Hopper (Cape Town). P. J. Gold (Benoni).

Member of Council. Member of Council.

T. Miller (Harrismith). Councillor Gilbert (Harrismith). H. Brittle (Cradock). T. Jagger (Ladysmith). Councillor Francis (Bethlehem). Councillor Hudson Port Elizabeth). M. McDonough (Bethlehem). G. A. Stewart (Bloemfontein). Councillor Payne (Durban).

Hon. Sec. & Treas. Mem. of Council. Mem. of Council. President. Vice-president. Mem. of Council.

Coun. Crawford Bloemfontein). E. Poole (Durban). T. Wolley-Dodd (Pretoria). Col. Dobson, D.S.O. (Johannesburg). John Roberts (Durban). B. Sankey (Port Elizabeth). W. Bellad-Ellis (Queenstown). Coun. Birschoff (Pretoria). W. H. Blatchford (Greytown).

Members and Delegates at the Second Annual Convention of the Association of Municipal Electrical Engineers (S.A.), held at Durban, August 27th to September 1st, 1917.

Mr. E. Poole (Durban) was elected secretary and treasurer. It was resolved to hold the next Convention at Port Elizabeth.

At the conclusion of the business meeting, the Mayor gave an official luncheon to the members at the Royal Hotel, and in the afternoon a visit was paid to the soap works of Messrs. Lever Bros.

On Tuesday the president delivered his address, after which an interesting discussion took place on Mr. John Roberts's paper on "Tariffs," which was held over from the previous Convention. In the afternoon visits were paid to the electric power station at Durban, the tramway department, and the municipal telephone exchange. In the evening, by invitation of the engineering section of the Natal Society for the Advancement of Science and Art, members attended a meeting at which a paper on "Municipal Electrical Undertakings in South Africa" was given by Mr. E. Poole, assistant electrical engineer to the Durban Corporation.*

* Abstracted in the Electrical Review, October 5th and 12th, 1917.

and important resolutions were adopted for circulation amongst all South African municipalities. The appropriation of net profits from undertakings for the relief of rates was very strongly condemned.

The next paper was by Mr. E. J. Hamlin on "The Design, Operation and Management of Small Electric Power Stations."

The Convention closed with appreciative remarks by the various Councillors of the municipalities represented, who spoke of the great help the Convention had been to them.

Address by Mr. John Roberts, President.

(Abstract.)

We must place on record the satisfaction we must all feel at the very worthy part played in the sphere of military affairs by our past president, Lieut.-Col. Dobson, who 15 months ago left for German East Africa in charge of a regiment of pioneers of his own raising, and who, after about six months' service in the field, returned crowned with honours and his present high rank. It must reflect credit on us as his colleagues that our past president should have

demonstrated so well the usefulness of the electrical engineer in modern warfare, and we thank him accordingly, and congratulate him heartily on an achievement which he will probably rank higher during the rest of his career than anything else he has done.

When the war is over the engineer, and particularly the electrical engineer, will be looked to to perform the many and much-needed tasks of reconstruction to make good the fearful devastation which has been brought about. New schemes of development, particularly in the Colonies, are completely arrested until the war is over. In our own country the Rand Water Board has postponed a gigantic scheme to carry water from the Vaal to the Rand. The Johannesburg municipal electrical scheme has two large turbines to install which cannot be delivered. The Capetown Municipality has a large water as well as a sewerage scheme in abeyance. Pietermaritzburg has hung up large extensions to its electricity undertaking. In Durban large projects for the establishment of industries, such as cement and soap making, were postponed when war broke out.

A committee of technical experts has been appointed to study the possibilities of new industries in South Africa, with Mr. Bernard Price, chief engineer of the Victoria Falls Power Co., as the chairman. I am sure that great good will result from that committee's labours, for the possibilities are tremendous.

The work of the electrical engineer is bound to be intimately associated with the development of South Africa. The day is not far distant in England when the generation of power will be done in mammoth stations, and the small towns will give up their small, inefficient stations. But in South Africa it will be many years before the towns will be linked together into one common network, though it is bound to come one day, and for some time yet every town must be responsible for the supply of current within and around its borders.

Knowing, as we all do, the stimulation to industry which a good local supply of electricity brings about, it follows that municipal electrical engineers must wake up to their responsibilities to local industries, and place themselves in a position to meet any reasonable demand for power which may be suggested in their territory. By such a policy they may be able to promote local industries which otherwise may be driven to larger centres of population where a supply of current can be secured.

Wattle-bark, up to the breaking out of war, was exported as it was stripped from the tree. It would be much more sensible to export the extract instead of the bark, thus saving considerably in freight and yielding the tanning product locally, which would undoubtedly tend to the quicker establishment of an industry to turn our hides into leather. Such an extraction plant will soon be in operation near Durban. But why not up-country, where the bark is grown? It will rest greatly with municipal electrical engineers to induce manufacturers to manufacture as near the seat of agriculture as possible, instead of railing the raw material to the large towns to be manufactured there. Other cases could be quoted.

It is not out of place, therefore, to call your attention to the necessity of a careful study of the possibilities of the establishment of local industries in your respective territories. In many cases you will have to study the manufacturing conditions closely in order to put yourselves in a position to advise as to the best way to apply electricity. Usually the owner is not acquainted with the electric drive, and one has to know sufficient of his work to demonstrate not only how to solve the power problem, but to show in what way electricity will be superior to steam. In Durban, we have found it necessary to get some acquaintance with a number of widely different industries.

As we municipal electrical engineers stand as the exponents of electrical enterprise, we must keep before the farmer the advantages of electricity, especially in irrigation work, and should make ourselves acquainted with the immense work done in this direction in the Western United States, where vast tracts of arid deserts have been made to blossom by water pumped by electric power. And everyone in his territory must be a missionary spreading the doctrine of "electricity for the farmer." One's efforts should not be confined to those within reach of the mains; one may recommend a farmer to put in his own little plant, and then, when his example has been followed by his neighbours, a demand for current will be created sufficient to warrant taking lines out to shut up the isolated plants.

As a result of the great progress the farmer is making in cattle raising, the meat industry is looming up, and there can be no doubt that our limitless veldt will produce meat in quantities comparable with what the Argentine is doing. A large export of meat will bring with it the possibilities of many new industries, and every live electrical engineer must get into a position to cater for demands for power which may arise in connection with these. The number of mills for crushing and milling maize is likely to increase, and a flour mill should be an excellent customer for power. Frequently they run for 24 hours per day, and preferential terms could be offered.

The small station should be so designed as to be able to deal with demands for power at moderate charges. The total cost in the small undertaking is high in most cases because the standing charges are excessive, due to the small production, but this cost would automatically fall if the output could be brought up, for instance, by the addition of a good power load. But in some cases the variable costs, principally fuel, are also high, and this high figure per unit will not go down much with addition of load. The aim must be to lower fuel and repairs cost to the minimum, so that by increasing the output the total cost will not increase much, due, of course, to the standing charges remaining fixed. To secure such a state of things it is useless to run a plant with non-condensing steam engines, even where coal is cheap.

I do not think that the Diesel engine is the right solution. The fact that one has to depend on fuel from overseas is sufficient to condemn it. I am surprise that the gas engine has received such comparatively small support from the municipal electrical engineer of the small town.

Standardisation is in the air all over the world, and the need of more uniformity in all branches of engineering than now exists is really very pressing. We shall place the electrical industry under a debt of gratitude to us if we can do something to reduce the great and unnecessary variety of plant and apparatus which now has to be stocked. We happen to have a great opportunity before us at the present time. A few months ago the Natal Engineering Society made representations to the South African Institute of Electrical Engineers in regard to general engineering standardisation. It then appeared that a Standardisation Committee had been in existence in Johannesburg for many years past, but for some time its activities had been suspended. The representations we made roused considerable interest, and the outcome was that a new committee was got together, in Johannesburg in May last, and Mr. F. W. Mills, chief railway electrical engineer, was appointed chairman. I trust that at our convention we shall have time to give the matter of standardisation, both of systems and supplies, considerable attention.

This important question is brought into prominence at the present time owing to a most interesting development in the railway policy of South Africa which is foreshadowed by the general manager, Sir Wm. Hoy, in his last annual report. That progressive administrator is thoroughly alive to the benefits which the large railway system he controls would derive by the introduction of electricity instead of steam as the motive power not only for suburban but for main-line trains.

We are closely interested in the subject because the South African railways have (under the advice of Mr. F. W. Mills) given up generating current for themselves, and now in all the principal towns of the country take their supplies of electricity from the local municipal plants. It follows that when the time comes, as I believe it will at no distant date, when the administration must consider supplies of electricity on a large scale for railway power, the municipalities will be given an opportunity of submitting propositions for such a supply. Within the next few years, therefore, some understanding between the municipalities should be come to as to the terms which should be offered, class of current supplied, &c.

Many of us are carrying out our work under arduous conditions in these trying war times. The ranks of engineering artisans have been depleted more than those of most businesses owing to the great demands for engineers made by the war, and the war has indirectly brought about great engineering activity in peaceful employments because we have been called on to make locally many things we used to import, owing to shipping difficulties and prohibitions on export.

In Durban, owing to local supplies of cement the cost of concrete has not advanced much, and we have adopted in certain instances concrete poles in place of steel or cast-iron.

Distribution lines and cables are one of the most difficult class of supplies. We have gone over our distribution plans very carefully to discover where copper is in excess, and have taken down one long overhead high-tension line and made up from it three shorter lines to feed the central district, and are recovering a good deal of underground cable, which will come in for low-tension distribution. We are also taking down ground wires which we regularly employed above all high and low-tension overhead conductors, as we are doubtful if these are of the value we used to think they were. This will yield us considerable quantities of bare copper wire for small extensions of our lines. Fortunately, the new demands from large consumers of power are not coming in fast, as such consumers cannot obtain machinery for new enterprises.

Meters at the present time are very difficult to obtain, and we are putting into service a number of old types of meters we took down as being obsolete, but which we kept in reserve for unforeseen emergencies; they are coming in very useful now.

We have had to do quite a lot of constructional work both in the power station and outside, and owing to the high price of steel sections of all kinds we have very largely used old steel tram-rails for all kinds of work—generally in combination with concrete. We have built up switchboards with these rails as a framework, using asbestos "Eternit" or similar sheeting as coverings and as partitions. Latterly we have been bringing in old boiler tubes as uprights for switchboard panels. Though the general appearance is not so good, it must not be thought that the results so far as reliability goes are any worse; in fact, we have aimed at doing better work than usual now, as it is important to reduce maintenance costs on account of the shortage of skilled attendance.

We have planned to build a new condensing water pipe line of reinforced concrete pipes 21 in. in diameter. The local cement, though slow in setting qualities, gives quite satisfactory reinforced concrete results. Speaking generally, it is wonderful what can be done when one is thrown on one's own resources. Scrap heaps should be carefully sorted over and the materials classified, and much old stuff which it would not have been profitable to use before is now worth money.

We are using old short lengths of trolley wire, bound together, as switchboard bus-bars, and in some cases are putting this up in place of heavy bus-bars, which can thus be taken down and used elsewhere. It is a great satisfaction to know that porcelain insulators are now made in the Transvaal.

Enclosing globes for street lighting are very scarce, but we are discarding these in some cases, and do not find much disadvantage.

At the convention resolutions were adopted stating that all charges arising between different departments of a municipality should be based on standard tariff charges where such exist, and in the absence of such standard charges, should be based on the net cost of services given or received; that in the opinion of the Convention it is unsound policy, as militating against the successful financial operation of municipally-owned electricity undertakings, to allocate net surplus profits for the relief of rates or for municipal funds, or to make indirect charges so as to unfairly reduce net surplus profits; that the rapid introduction of new and improved machinery for the production of electricity renders it imperative that every electricity undertaking shall set aside out of its net surplus profits an adequate amount to write off obsolete plant; and that the only legitimate outlets for net surplus profits are the building-up of an ample obsolescence fund, and the reduction of the charges to the consumer in order to encourage the use of electricity.

On the suggestion of Mr. Poole, it was resolved that the various municipalities be invited to furnish the secretary with a schedule of obsolete electrical stocks, with a view to such stocks being exchanged or bought where a demand exists, the prices of such stocks to be those existing before the outbreak of war.

The following important recommendations were made in regard to standards, and were transmitted to the South African Standards Committee sitting in Johannesburg:—

Standards Agreed.

1. Current	... Alternating.
2. Periodicity	... 50 cycles per second.
3. Number of phases ...	... Three.
4. Generating pressures	... 415, 3,300, and 6,600 volts.
5. Supply pressures ...	... 240 and 480 volts three-wire, 240 and 415 A.C. four-wire.
6. System of distribution	... Four-wire, three-phase.
7. Transmission pressures	... 3,300, 6,600, and 11,000 volts.

Bare Conductors for Overhead Lines.—Nos. 12, 10, 8, 6 S.W.G., and beyond these sizes, the same sizes laid down by the British Engineering Standards Committee, but with the deletion of the following sizes:—.125, .25, .35, leaving .05, .075, .1, .15, .2, .3, .4, and .5 sq. in.

Underground Mains.—On the types of cables, it was decided to recommend that the system of protection adopted be uniform, viz., that the cables should be armoured suitable for laying direct in the ground, the sizes of conductors to be similar to those recommended by the British Engineering Standards Committee, with the deletion of the same sizes referred to in the bare conductors for overhead mains, leaving the sizes for adoption as follows:—.05, .075, .1, .15, .2, .3, .4, and .5 sq. in.

It was also resolved to recommend that, as it was desirable that the various kinds of mains in use should be readily distinguishable from the outside without cutting the cable, makers should be asked for suggestions in regard to this matter, such as by varying the width of the standard tapes, or by introducing a steel wire or wires in the jute serving, commonly used over the armouring.

Meters.—That two two-wire meters be adopted for use on low-tension supplies in preference to three-wire meters. Sizes:—3, 5, 10, 25, 50, and 100 amperes.

Plugs for Heating and other Circuits.—This matter was referred to the Council to decide upon certain standards as regards sizes, dimensions, &c.

An Electric War Boat.—The Secretary of the Admiralty on Saturday issued the following statement:—

"An attack was made to-day on our vessels patrolling the Belgian coast by an electrically-controlled high-speed boat. The attack was defeated, and the boat destroyed."

Various methods of controlling boats, aircraft, &c., from a distance by wireless transmission, or by sound waves, have been described in our pages; none of them advanced beyond the experimental stage, but perhaps the Germans are trying to develop some such system on a practical scale.

The *Times* states that four such boats have already been destroyed; they are propelled by petrol engines, electrically controlled from the shore, and convoyed by aeroplanes. The Admiralty regards them as "freak vessels."

THE ENGINEER AND AGRICULTURE.

The report of the Sub-Committee of the Conjoint Board of Scientific Societies on the Application of Science to Agriculture, which has been recently issued, reads as follows:—

This Sub-Committee was constituted "to inquire into and report upon the work at present in progress on the application of science to agriculture, and to make such recommendations as they think fit with a view to promoting the application of engineering to this subject."

The Sub-Committee comprised the following members:—Lord Portsmouth (chairman and convener), Mr. A. E. L. Chorlton, Mr. A. D. Hall, and Sir John Snell. To these names the Executive Committee added Dr. J. A. Voelcker and Captain J. Bell White, R.N.R., the representatives of the Agricultural Society, and the Agricultural Organisation Society nominated the Rt. Hon. F. Dyke Acland and Mr. J. Nugent Harris. The Sub-Committee has held three meetings, and has co-opted Mr. F. S. Courtney to assist it in relation to engineering problems.

The Sub-Committee decided that certain fundamental data were required, and that there appeared to be no Government department or organisation which possessed this information.

A sub-committee was therefore appointed consisting of Sir John Snell, Messrs. Courtney, Chorlton, and Nugent Harris, to obtain the necessary information. A series of questions has been issued to various experienced authorities, and some most valuable and comprehensive replies have been returned.

Through the help of the Agricultural Organisation Society a careful census is now being taken in districts where there are various classes of agriculture. The object is to ascertain the amount of produce sent out from, and the raw materials conveyed to, these districts, and the times when such transport is effected; also the times occupied in seasonal operations on the land, whether ploughing, harrowing and cultivating, or reaping and threshing, and certain stationary operations. It is hoped from this detailed information to obtain valuable data on which to build practical estimates of the power required and costs of operation, and to compare the relative advantages and costs of steam or internal combustion machines and electrically-operated machines.

It is proposed also to report on the methods of transit and transport, possible co-operation, especially in the establishment of necessary repair sheds, tools, and skilled mechanics, and to endeavour to suggest practical standards of machines of various kinds.

Such an investigation must, from its nature, take some considerable time, but the Committee hopes to progress rapidly once the fundamental information and seasonal diagrams are available.

The Engineering Sub-Committee, after careful deliberation, has come to the conclusion that it cannot help effectively in the development of internal combustion engine-driven tractors, and for this reason: The Government have already put in hand many thousands of tractors, and practical application of so many various types of tractor must inevitably lead, by a process of trial and error, to a speedy evolution of types most suitable for the various conditions of soil and climate. Reasonable standardisation must also follow as a matter of course.

The Sub-Committee, however, emphatically believes that a great future awaits the development of electrical applications to agriculture in this country. While, on the one hand, in Germany enormous developments have taken place in agricultural districts, and farmers have increasingly utilised electric power, not only for stationary motor purposes, such as threshing, grist mills, and cream separation, but also for ploughing, cultivating, and hoeing; on the other hand, in this country, it must unhappily be said that no applications of electricity to agricultural purposes beyond that of the farmstead have been made. This position, no doubt, largely arises from the fact that practically no electricity has been as yet distributed in agricultural districts.

A Departmental Committee of the Board of Trade on Electric Power Supply has been sitting for some months past, and it is probable that wider powers of distribution will be granted in the near future, and that cheap power will be available for transmission, not only to industrial districts, but also, should the demand arise, to agricultural districts.

In the Report to the Board of Agriculture on "Agricultural Credit and Agricultural Co-operation in Germany" (Cd. 6,626) it is stated that in 1913, electrical power was already being utilised by large landowners to a remarkable extent, and that its use had been stimulated by the marked increase in the employment of both large and small agricultural machinery. Electricity was then extensively employed, especially for driving threshing machinery, hoes and cultivators, grist mills, cream separators, &c., and it was anticipated that electrically-driven ploughs would increase considerably in number. There are already several different designs of electric ploughs in use, but they are said to be expensive in first cost, and in Germany, on this account, they were then only considered profitable for farming areas of about 1,500 acres and over, and were only procurable by large owners or combinations of small owners. The report says that electrical ploughs "are stated to be more advantageous than steam ploughs, and that the use of machinery has been

stimulated by the dearth of farm hands, and not only has the introduction of electrically-driven machinery partially met this need, but it has also made the task of very small farmers less strenuous."

The report also says that "apart from the advantage of saving or replacing labour, electricity is advantageous to farmers through the low cost of maintenance of the electrical apparatus, the absence of running expense when not being utilised, the rapidity with which it can be put in operation, its simplicity for handling, the facility with which the motor can be applied to the working of several machines simultaneously, its precision, its cleanliness, its freedom from danger of fire, and, under normal conditions, its comparative cheapness."

The Sub-Committee believes that electric power can be distributed to farms at prices which would pay the farmer. There is no question as to the economy of electric motors for stationary purposes, and the important matter which requires practical experiment and proof is the application of electricity to ploughing and cultivation, reaping and binding, &c.

An electrically-propelled plough or other agricultural machine would be both simpler in construction and easier to handle, inspect, and repair than an oil-driven machine. There worked implements, as the source of power (*i.e.*, coal or the change of speed and speed control is greatly easier, and the protection of motors and reduction gear from dust and dirt can be made absolute.

A national advantage would lie in the use of electrically worked implements as the source of power (*i.e.*, coal or water) is in the country, whereas oil would generally have to be imported for the larger internal-combustion motors.

Electricity may also be used for intensive cultivation. Experiments have already been made on a reasonably extensive scale which go to show that, *ceteris paribus*, there is an increased yield when high-pressure electricity is discharged above the cultivated area. Further research is required in this important matter.

The Engineering Sub-Committee recommends that arrangements should be made with an experienced agricultural implement manufacturer, and an experienced electrical plant manufacturer to design, construct, and test practically an electrical tractor, and possibly other agricultural machines.

A resolution of the Conjoint Board was made unanimously on October 10th, 1917, as under:—

"The Conjoint Board recommend that the Board of Agriculture be asked to grant the necessary funds for designing, constructing, and testing practically an electrical tractor and certain other agricultural machines, and to appoint the Agricultural Sub-Committee (or some of its members) as an Executive Committee, to superintend the designing, building, and testing of such plant, and to prepare a report thereon."

The Electrical Sterilisation of Milk.—The process by which milk is efficiently sterilised with the aid of alternating current, without affecting its taste, composition, or nutritive qualities, at one of the milk depôts of the Liverpool Corporation, under the supervision of Prof. J. M. Beattie, was described in a recent issue of the *Practitioner*. As we have received inquiries lately on this subject, we may mention that a full illustrated description of the process appeared in our issue of July 31st, 1914.

THE TEMPERATURE CONTROL SYSTEM IN THE CHARING CROSS HOSPITAL.

The necessity of maintaining an equable temperature in hospital wards will immediately be recognised, and any method of accurately and conveniently measuring the temperatures of the various wards throughout the building is of importance as a means to this end.

A short description of the system of temperature control employed in the Charing Cross Hospital will therefore be of interest. In this hospital the thermometers fixed in the wards each consist of a coil of platinum wire, suitably protected, forming the bulb of a platinum resistance thermometer and connected by ordinary copper leads to a indicating switchboard erected in the engineer's office. One of these thermometers is indicated by an arrow in fig. 1. All the thermometers from the various wards are wired to a single 32-point switchboard, and by means of a plug connection any required thermometer can be connected to the indicator, which is calibrated to give direct readings of temperature. By this means the temperatures in all the wards are easily determined at regular intervals, and the saving in time and labour effected by such a centralised system is obvious.

Fig. 1.—George Drummond Ward, Charing Cross Hospital.

Fig. 2.—Switchboard in Kitchen.

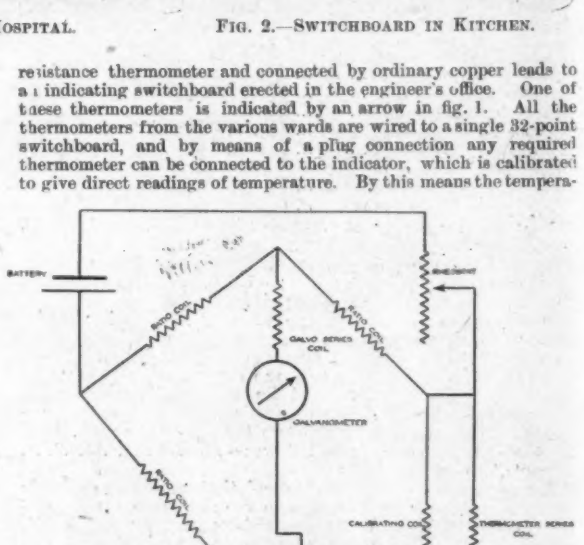


Fig. 3.—Diagram of Connections.

In the kitchen of the hospital a similar installation of thermometers is employed for measuring the temperatures in milk sterilisers and gas ovens. Fig. 2 illustrates the switchboard belonging to the kitchen installation.

As will be seen from the diagram of connections given in fig. 3, the instruments operate on the Wheatstone bridge principle, the bridge being balanced at the zero position of the indicator and the

deflections being caused by the current which passes through the galvanometer coil when a change in the temperature of the thermometer throws the bridge out of balance. The current necessary to operate the thermometers is supplied by a 4-volt accumulator. In addition to the various thermometer switches on the board, there is a switch marked "test," and when the plug is inserted in this switch the pointer of the indicator is deflected to a certain position marked on the scale if the instrument is in correct adjustment. A means is provided of readily compensating for any variations caused by a fall in the voltage of the accumulator.

In addition to the two sets of electrical thermometers, the Charing Cross Hospital has also installed a number of H. and M. mercury-in-steel recording thermometers for giving continuous records of water, steam, and flue-gas temperatures at various points in the heating system. One of the instruments also serves to record

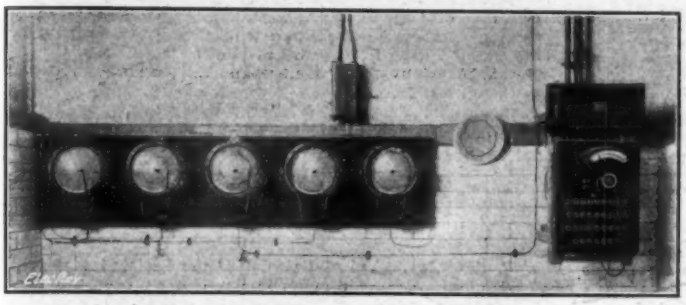


Fig. 4.—Temperature and Pressure Recorders, and Thermometer Switchboard.

the steam pressure in this system. A view of these temperature and pressure recorders, together with the distance thermometer switchboard for taking ward temperatures, is given in fig. 4. The recording thermometers have each a steel bulb placed at the point where the temperature is to be determined and connected by the requisite length of steel capillary tubing to a Bourdon spiral fixed behind the dial of the recorder. The bulb, capillary tubing and spiral are filled with mercury, and changes of temperature in the bulb give rise to corresponding changes of pressure inside the instrument, these being magnified and recorded on a circular chart calibrated in degrees of temperature, by means of the usual pen mechanism in connection with the Bourdon spiral.

The thermometer installations at the Charing Cross Hospital were carried out by the Cambridge Scientific Instrument Co., Ltd., Cambridge, under instructions from Mr. A. H. Barker, Wh.Sc., consulting engineer.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The E.T.U. or the A.E.S.E.?

It is interesting to read the mass of correspondence served up by the respective Secretaries of the E.T.U. in the frantic endeavour to bolster up their claim to represent the electrical station engineer.

Unfortunately for the E.T.U., the letter from the St. Pancras B.C. is obviously an answer to an inquiry, and offers no proof that the E.T.U. had anything to do in the matter of war bonus and wages.

Regarding the letter from the North Metropolitan Electric Power Supply Co., the managing director distinctly states that "the arrangement only applies to weekly or hourly-paid men," which, of course, rules out the engineers-in-charge at the power stations.

It is evident to the least initiated that the electricity supply chief engineers, being clever and far-seeing men, will be quite approachable and considerate in the matter of war bonus, in order that the efficiency of their undertakings shall not suffer owing to having assistants who are harassed by pecuniary troubles. It is, therefore, up to the A.E.S.E. to see that the E.T.U.'s aggressive methods do not get the credit for all justice meted out to the electrical station engineers.

I certainly hope "W. F. K." is a member of the E.T.U.

C. B. T., *A.M.I.E.E.*

The letter of "W. F. K." in your last week's issue is amusingly satirical, but volubly incoherent. No useful purpose is served by shelving the problem or obscuring issues by an indiscriminate application of a gift for cynical asperity—except, perhaps, to provide a little harmless amusement.

A remembrance still lingers of a casual acquaintance with the Euclid of our studious youth—how each proposition was clearly set out and the proof arrived at by the test of logic. It should not be a serious matter to apply that test to our present proposition.

Upon what are Associations based?

The hand of precedent here guides us. The world is an Association of nationalities; nations are Associations of races; races, Associations of individuals. Each way we look, there we find Associations, companies, societies, unions, federations, and the like. They are in, and of, science, industry, commerce, literature, religion, the drama, art, philosophy, and entertainment. But why? Because there exists a common denominator. That is fundamental to every nation, race, or association—it is the essence of collectivism.

Testing our conclusion, we find innumerable examples in the history of associations where, with the loss of that common denominator, collectivism sub-divides or dissolves into individualism.

Leaving generalities and applying ourselves to the specific case in hand—an Association of Station Engineers—we may set it down as sound theory, if an incorrect statement of practice, that all station engineers have identical training and qualifications. Assuming this, we conclude a common denominator—viz., identical training and qualifications.

Did we carry investigation no further, then surely here are all the elements of Association.

Our investigation, however, is incomplete; there is another possible common denominator—viz., degree of administration. All presumably are administrative; the difference is one of degree, and herein lies our problem.

If the common denominator is theoretical equality of engineering training it must be an invariable, and an association so founded would be stable.

If the common denominator is degree of administration, then it is a variable, and an association so founded would be unstable. But it is neither the one nor the other; it is one qualified by the other.

We are forced, then, to the conclusion that an association would only be stable between the limits of the purely administrative and the wholly operative.

Exactly who is between these limits is a matter for individual decision; classifications and designations are misleading.

The need for an association exists beyond doubt, but the crisis that makes clear such need is not necessarily a common denominator upon which to found an association.

Confusion of thought only leads to recrimination; so soon as it is clear that economic pressure is the cause, and not the common denominator, every section will sort itself out on the basis of the common denominator.

London, S.W. H. W. Healy.

It would be interesting to know how it comes about that correspondence between this Association and a Government Department finds its way into the hands of the Electrical Trades Union. In case, however, the reply made by this Association to the letter from the Chief Industrial Commissioner's Department, sent to you by Mr. W. J. Webb, has not already been brought to his notice, I enclose a copy for publication.

W. Arthur Jones,
Hon. Sec., Association of Electrical Station Engineers of London.

Leytonstone, *November 5th*, 1917.

[COPY.]

"*October 19th*, 1917.

"Sir George Askwith.
"Chief Industrial Commissioner's Department,
"Ministry of Labour, Whitehall.

"Dear Sir,—Yours of yesterday to hand. I note your suggestion with regard to communicating with Mr. W. J. Webb, of the Electrical Trades Union.

"This suggestion is evidently based upon a misconception of the true situation, and the following facts should make this clear. This is not a quarrel between two sets of Trade Union officials as to which Union can claim the greater membership. This Association has no paid officials—its acting officers are engineers engaged in power stations, and have, therefore, a fully developed sense of their responsibilities.

"The London power stations are, at this moment, vital key industries directly controlling the output of war material. The suggestion that the highly trained engineers in control of this important section of national industry should become absorbed by the Electrical Trades Union (which is essentially a wireman's Union, and has only recently taken advantage of dissatisfaction amongst substation men—mostly L.C.C. men—to embrace them, and thus claim to represent engineers-in-charge), is unquestionably opposed to national interests.

"No section of men have been more loyal or patriotic than power station engineers, and I suggest that it is vital to preserve their entity.

"As your letter is in no way a reply to my communication of the 17th inst., I shall be glad to receive either a negative or affirmative concerning representation at the impending conference between the A.M.E.E. and E.T.U.

"The fact that this Association has in its membership practically every engineer-in-charge at the 30 London Council stations cited by the E.T.U. should in itself be sufficient evidence of the grotesque nature of the claim made by the E.T.U. to represent power station engineers.

"In view of the urgent nature of the matter, I shall be glad to have an early reply in order to place the matter before the Executive Committee.

"Yours faithfully,

"(Signed) W. ARTHUR JONES, A.M.I.E.E."

The following is taken from the "Branch Notes" of the *Electrical Trades Journal* dated September, 1917 :—

"Our slogan should continue to be that membership of our Union carries with it exemption from military service. Nothing else will satisfy us; anything less—well, there is trouble for someone."

Earlier in the same note attention is drawn to the increasing membership of the Union, and before the Chief Industrial Commissioner, on September 5th, emphasis is again given to this feature. A not unnatural inference from this would be that there is some connection between the increasing membership of this Union and the claim of exemption from military service for its members, but such an inference would be altogether wrong, because of the members already serving with H.M. Forces and because of those willing to serve when required to do so.

So far as is known, the E.T.U. is the only one claiming for its members exemption from military service. It cannot be that the majority of the members of this Union are willingly supporting their officials in such a claim, but that through ignorance of one of the objects, they are supporting through their Union a principle which is altogether foreign to their own real feelings.

J. R. W. Grainge.

London, W., *November 1st*, 1917.

[The passage quoted may represent the policy only of a particular branch of the Union ; we hope that it is not endorsed by the Union officially. Perhaps Mr. Webb will clear up this point, the importance of which cannot be denied.—EDS. ELEC. REV.]

With your kind permission, I should like to state my experience whilst a member of the A.E.S.E. I joined the A.E.S.E. soon after the Manchester Branch opened. At that time anyone was eligible to become a member provided he worked in an electrical station. The cleaners, better known as "assistants," were admitted to membership. There was no distinction. Personally, I thought that a good kick-off for social reform. The majority of the members, I feel sure, very sensibly advocated Trade Union principles, referred to by "Status" as "agitators." The other section, better known as "Status Engineers," did not desire to associate themselves with such an unhealthy system for fear of losing the respect of their chief, who is slowly grinding them down.

These are Trade Union methods : "Peaceful persuasion first"; if this is not effective, and it rarely is, then strike. Chief engineers and employers of labour do not like to be forced against their will, hence you lose their respect and good feeling ; on the other hand, you gain the coppers. "Status" evidently prefers the respect !

"Status" also says, "If the A.E.S.E. joined the E.T.U. there would be a division in their ranks." It is evident that they have not yet lost *their* agitators.

The E.T.U. are anxious to welcome these so-called agitators. They want to better their conditions, and they can do it. Let "Status" remember that the A.E.S.E. was allowing us to struggle on with a starvation wage. We are told to be patriotic because we are at war, but patriotism evidently is not in the category of the profiteer. Let the capitalist satisfy his greed while we continue to be patriotic. This appears to be the motto of the A.E.S.E.

Alpha.

In the current issue of the ELECTRICAL REVIEW, under the above heading, Mr. H. H. Morton makes certain statements which cannot be allowed to pass unchallenged.

He states that among the employés of the North Metropolitan Electric Power Supply Co. the E.T.U. have a membership of over 50, which may be correct, but read in conjunction with the previous paragraph it might be inferred that the 50 members include the supervising grades of power-station charge engineers. I challenge Mr. Morton to give the name of one member of the staff—that is to say, a technically-trained engineer in responsible charge of a watch in any of the company's power houses—who is enrolled in the E.T.U. The membership of 50 does embrace sub-station attendants and various lower grades down to and including trimmers and yardmen.

I hold no brief for the A.E.S.E., but, in common with my colleagues, I strongly object to the action of the E.T.U., which purports to speak for a class of men who are not, and do not wish to be, in any way associated with them.

With regard to the imputation of misrepresentation which Mr. Morton accuses the A.E.S.E. of making, I make no comment, as this matter will probably be dealt with by correspondents more conversant with the facts than I am. I do, however, charge Mr. Morton with direct misrepresentation when he states that the E.T.U. obtained the Engineering Award for "our North Metropolitan members."

As one of the principal assistants in the company, I am in a position to know that the question of making further increases in the rates or bonuses already paid was being considered before any sort of action was taken by the E.T.U. It is not too much to say that the action of the Electrical Trades Union had, if anything, the effect of delaying the increase rather than of assisting the employés.

F. D. Napier,
Resident Engineer.

Willesden Power House,
November 6th, 1917.

The Teaching of "Electrical Installation Work."

A practical man, who has evidently been a student also, comments (in the current issue of one of your contemporaries)* on his experience of the unsatisfactory nature of the treatment of the above subject.

He mentions a class of 12 students where the workshop equipment consisted of "one saw, two screwdrivers, one pair of pliers, wood casing, and a few pieces of scrap wire." If it be assumed that he has omitted some items—such as jointing materials—he makes it clear that there was "no conduit, and no distribution boards, cut-outs, bells, or fire alarms."

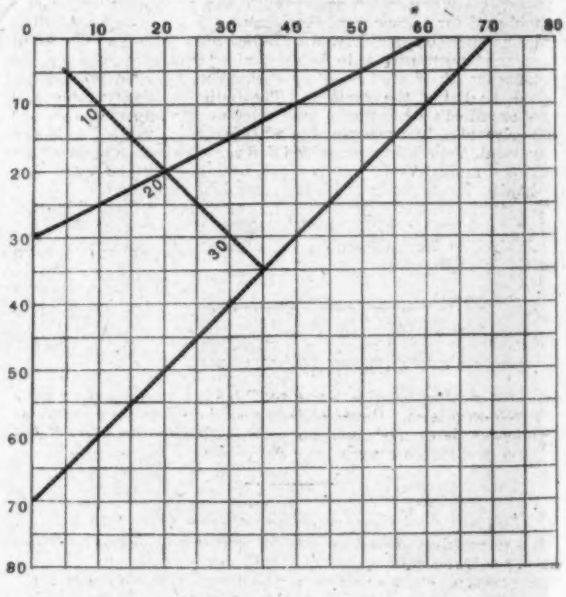
There is much more in the letter, pointing to utterly inadequate and unsuitable methods of instruction ; and we mention it here as it bears out what we have said many times in your columns.

A. P. Lundberg & Sons.

London, N., *October 29th*, 1917.

A Graphic Method of Calculating the Resistance of two Circuits in Parallel.

In your issue of January 24th, 1913, and since in a later issue was described a method for calculating the resistance of two or more circuits in parallel. Having had a number of calculations to make, I thought the simple way in which a "shunt calculator" may be made might be of interest to your readers. All that is necessary is a



piece of cross-sectioned paper on which the abscissæ and ordinates are marked off in equal dimensions from 0 to 100 to any convenient scale, say, 2 cm. = 10 ohms, starting from the top left-hand corner. The diagonal is now drawn as shown. It will be seen that the diagonal division = $\sqrt{2}$, or 1·414 times a division on the sides.

Hence, if we put a straight edge on 30 ω and 60 ω, it crosses the diagonal at 20 ω, which is the joint resistance.

L. O. Meyer.

Bedford, *October 29th*, 1917.

Dublin Electricians' Wages.—Some time ago the Dublin Electrical Trades Union and the Master Contractors' Association failed to come to an agreement as to an award of 15s. increased wages, passed by the Committee of Production, and the Union men ceased work. Ultimately the masters made an offer, which was accepted unconditionally and without prejudice to any demand in the future. The old rate of payment was 9½d., with 2s. 1d. war bonus, equal to 10½d. per hour (50 hours); the new rate is 1s. per hour (50 hours), and a special rate of 3s. per week for those engaged on war work.

---

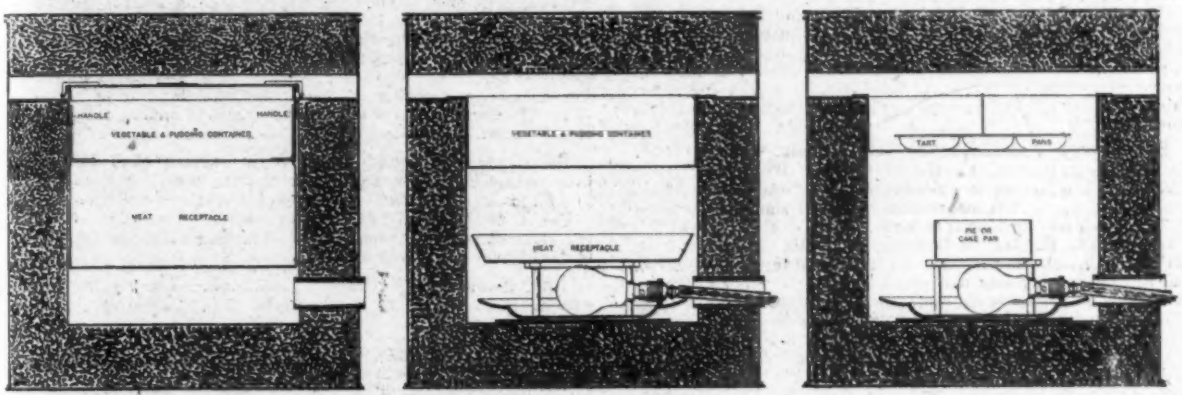
* *Electricity*, page 651.

A PORTABLE ELECTRIC-LAMP COOKING BOX.

Mr. Leoline Edwards, of 81, St. Margarets Road, Twickenham, has brought to our notice an ingenious device calculated to bring electric cooking within the reach of everyone who has an electricity supply. It consists essentially of an improved "hay-box" provided with a heating element to maintain the temperature necessary for cooking, thus getting over the inherent defect of the plain hay-box. The heating element is nothing more elaborate than an ordinary 32-c.p. carbon lamp, attached to a length of flexible, which can be connected to any lampholder with the aid of an adapter. The construction of the box is shown in the accompanying figures. It consists of two iron cases, thermally insulated from one another by "Quidos" expanded cork—a material originally produced by the inventor for other purposes, but admirably adapted for heat insulation, as the granulated cork is put through a treatment which expands the air cells to twice their normal size, resulting in a light, resilient, and sanitary material, which cannot become sodden with water and is very durable. Its thermal conductivity is stated to be 0·041. A hole is provided near the base of the box, through which the lampholder is passed, the lamp being inserted from the inside; the loss of heat through the hole is trifling, and the faint light which escapes affords an indication that the lamp is alight. The inner case is specially designed for convenience in use, and handy stands are provided which enable several dishes to be cooked simultaneously; the ordinary hay-box must on no account be opened after the hot dish has been placed inside it, but the electric hay-box can be opened for inspection or removal of the dishes without affecting its functions, as the temperature is soon restored by the lamp to the proper value. The maximum power consumed is 120 watts, and the cooker can be left unattended for hours without risk; it can also be used in any room where current is available, being perfectly portable.

Mr. Edwards has tested the cooker repeatedly in steaming and stewing foods, roasting and stewing simultaneously, and in baking pies, cakes and pastry. Hot water put into the cooker can be kept hot for use at any time, a convenience at night in case of illness; if the water is put in cold (50° F.), the lamp will heat 12 pints to 200° F. in seven hours, with an expenditure of less than one unit.

The cooker was designed to deal with small quantities of food, and thus does not compete with the more ambitious types of electric cooking apparatus. Actual experience shows that a dinner for three persons, consisting of 3 lb. of beef, roasted with potatoes, steamed turnips, beans, rice, and prunes, was done in 3½ hours; the cost, including electrical energy for the lamp, the renewal of the lamp, and gas for previously bringing to the boil four saucepans containing the vegetables, rice, and prunes, was three farthings. The apparatus, which will soon be on the market, can be seen and tested at any time by appointment. It measures 18 in. in diameter and 20 in. in height, and weighs 30 lb. Provisional protection has been applied for.



Sections of the Portable Electric-Lamp Cooking Box.

BUSINESS NOTES.

German Designs on Russian Trade.—"An illustration of the vigour with which Germany is preparing to carry on the economic war after the military campaign is over is furnished by what she is preparing to do in regard to Russia. It is stated from reliable sources that the enemy has already established classes in which discharged soldiers are being trained as commercial travellers for that country. They are taught the Russian language, Russian history, and Russian methods of business, and are otherwise prepared for the work which is supposed to lie before them. Moreover, a considerable number of women—some 40,000, it is believed—are also being taught Russian, so that they may be able to conduct correspondence and replace the sadly depleted ranks of male clerks. Yet another idea that is being developed is a scheme for providing Russian agricultural prisoners with sample machines to take back with them to their villages, with the promise of a commission on any they can sell. This should help to make us fully alive to the sort of competition we must be ready to face."—*Financial Times.*

Book Notices.—*Terms of Industrial Peace.* By Alex. Ramsay. London: Constable & Co., Ltd. 3s. net.—The author of this very readable contribution to what is really one of the most pressing subjects of the times, considers the relation, in the industrial equation, of the two factors, Capital and Labour, and endeavours to suggest a means by which the two may be brought into co-operation for their mutual interest and the good of the community. The main question at issue is that of wages; but wage is a relative term, and its value depends upon the commodities that can be purchased with what is earned. Employers must adopt improved production methods in order to carry the inevitable additional labour charges; they will need to show discernment and sympathy, and workmen must agree to abandon their attitude of hostility and suspicion and promote a willingness to co-operate in the extension of a system which will make it possible for Labour to prosper and Capital to get a fair return. Following a general statement along these lines, Mr. Ramsay devotes following chapters to the following matters, which have an important bearing on the whole subject:—The growing power and the immediate demands of Labour; how employers can increase production; the American example (manufacturing methods and the relations of employers and employed in relation thereto); education and environment; the mind of Labour; the machinery of arbitration; the control of food prices; the limitation of profits; and moral responsibility. The author covers a very wide ground, and touches upon many of the social conditions which in reality lie at the very root of the whole tree of discontent with life, and which, unless they are removed or ameliorated, will always prevent the full fruit of permanent industrial peace being achieved. We are all eager for millennial conditions to prevail in industry. It is right to have a high ideal in the matter, but we live in a very human world surrounded with all sorts of limitations hindering the success of our high endeavour. The future of the Labour and industrial world in all countries may be very different from the past, but we must not suppose that a new Heaven and a new Earth are going to be brought Phœnix-like from the ashes of a horrible war. Nevertheless, a proper study of the subject of industrial peace is everybody's duty, and Mr. Ramsay, who claims to know both sides of the case from experience, succeeds in stimulating helpful thinking.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXVI. No. 10. New York: The Institute. Price $1.

"Alternating-Current Electricity and its Applications to Industry." By W. H. Timbie and H. H. Bigbie. London: Chapman & Hall, Ltd. Price 13s. 6d. net.

"Elements of Electrical Engineering." Vol. I. D. and A.C. Machines and Systems. By W. S. Franklin. London: Macmillan and Co., Ltd. Price $4.50.

"Scientific Papers of the Bureau of Standards," No. 306. An experimental study of the Fahy permeameter. Washington: Government Printing Office. Price 10 cents.

Storage Battery Manufacture.—La Société des Accumulateurs Electriques (Anciens Etablissements Alfred Dinin) is the name of a new company which has lately been formed at Nanterre, with a capital of £60,000, to acquire and carry on the Dinin accumulator business.

Dissolutions and Liquidations.—Mea Magneto Co., Ltd.—Mr. C. R. Beeby, the controller, has applied for his release.

Steel's Electric and Engineering Co., Ltd., 206, East India Dock Road, Poplar.—In this matter (a winding-up order was made last July) accounts have been lodged showing total liabilities £1,054 (unsecured £664), assets £11, and a deficiency of £655 as regards contributories. Mr. W. J. Warley, Official Receiver and Liquidator, reports that the company is a private company promoted by T. G. Steel, S. F. Hastings and E. Lee. It was registered on August 23rd, 1916, with a nominal capital of £3,000, and was

formed to take over as a going concern the business of Steel Bros., and to carry on the business of electricians, mechanical engineers, &c. The failure of the company is attributed by Geo. Steel and S. F. Hastings to want of capital and pressure of creditors.

Moonshine.—Messrs. C. A. Vandervell & Co., Ltd., of Acton, have issued in the form of a picture postcard a useful November moon-chart which has been compiled by Mr. A. H. Midgley, their chief engineer.

Catalogues and Lists.—British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C.—There has been issued by the Lamp and Wiring Supplies Department a waistcoat-pocket card calendar for a year from last July. Supplies, overprinted with name and address of contractors and dealers, can be obtained on application to the Publication Department.

Messrs. Broom & Wade, Ltd., High Wycombe, Bucks.—Folder giving general particulars respecting Hyatt flexible roller bearings.

Mr. John Phillips, 166, Walworth Road, London, S.E. 17.—Illustrated leaflets showing new designs of his motor-driven commutator grinders.

The British Industries Fair, 1918.—Next year's British Industries Fair, for which application forms for exhibiting space, are now being issued by the Board of Trade, will be considerably larger than those of previous years. The last two Fairs were held in the Victoria and Albert Museum and the Imperial Institute, and the space available was not sufficient to meet the demands of the exhibitors. In many cases, in fact, exhibitors' applications for space had to be cut down by as much as 60 per cent., and the fact of the Fair being in two buildings caused some inconvenience. The 1918 Fair, which will open on Monday, February 25th, and remain open for a fortnight, is to be held in premises which the Port of London Authority have placed at the disposal of the Board of Trade, and it is hoped that the available space will be sufficient to meet exhibitors' requirements, at any rate for the coming year, as the Fair will, owing to the war, again be restricted to the following trades:—Earthenware and china trade; glass trade; fancy goods trade; paper, stationery, and printing trades; toy and games trade.

The 1918 building contains about twice as much space as was available this year. It is more conveniently situated for business men, being near the Tower Bridge, and is a large roof-lighted warehouse on one floor. Firms who are anxious to exhibit should send their applications for space to the Director, British Industries Fair, 10, Basinghall Street, London, E.C. 2, at the earliest possible moment.

Bankruptcy Proceedings.—Samuel Stephen Coster, electrical engineer, &c., 14, Gladstone Road, West Ham Park, trading as S. S. Coster & Co.—Under this failure, accounts have been lodged at the London Bankruptcy Court showing liabilities £670, and assets "bad book debts of £490." According to the observations of the Official Receiver, the debtor, in August, 1908, with £150 capital, became a partner in the business of electrical and mechanical engineer carried on at 114, Bishopsgate Street, E.C. That business was not a success, and was abandoned in June, 1909, whereupon the debtor started on his own account, and in his own name, at 78, Amity Road, West Ham Park, removing to Gladstone Road in 1912. Two years ago he adopted the style of S. S. Coster & Co., with a view to his son joining him in the business on his release from the Army. In November, 1916, his stock-in-trade and effects were seized and sold at the instance of a creditor, and very little business has since been transacted. The debtor attributes his insolvency to decline in his business through bad trade, lighting restrictions, and shortage of labour, to bad debts, and to his ill-health, which at times prevented him giving his full attention to the business. A sitting was held last week, before Mr. Registrar Hope, for the debtor's public examination. The Official Receiver reported that the debtor had not filed, cash and goods accounts, nor had he attended on the Official Receiver, as required to do. It was a case calling for considerable investigation; there were no books or banking account, and it was impossible to say what the debtor had done with goods advanced on credit and not paid for. His Honour adjourned the examination, and directed the debtor to furnish the accounts, and to attend on the Official Receiver forthwith.

Enemy Samples.—In the new Sample Rooms of the Department of Commercial Intelligence, 73, Basinghall Street, E.C., there is on view for the information of British manufacturers an exhibition of samples of German and Austrian goods, including many recent additions, showing new styles of goods that are being introduced in enemy countries.

Auction Sale.—Messrs. P. Huddleston & Co. will sell by auction at Hammersmith on Tuesday, November 20th, a quantity of electrical apparatus. Full particulars are given in our advertising pages to-day.

LIGHTING AND POWER NOTES.

Accrington.—The requisite notice is to be given, under the terms of the agreement for the supply of electricity to Haslingden, of intention to terminate such agreement on December 31st, 1918, for review and adjustment.

Australia.—With regard to the question of acquisition of a coal-bearing property by the Sydney Municipal Council, it is suggested that the Government Geologist, the Chief Inspector of Mines, and Mr. D. A. W. Robertson should consider the offers. A deputation is to wait on the Minister for Labour and Industry in regard to the alleged monopoly in connection with coal supply for electricity supply purposes.

According to the *Times*, restrictions imposed in Australia on October 11th on the use of fuel and power for industrial purposes were to be removed last Monday.

Bootle.—Proposed Plant Extension.—The question of electricity works extensions again came before the T.C. last week; the borough engineer reported that he had received an application from a cold storage firm for a supply of electricity to premises which it is proposed to erect in the district, but that the present generating plant will not permit of this being done. Eight other applications for large supplies had already been refused, and the demand for current was steadily increasing. The Electricity Committee strongly expressed the opinion that it was imperative that additional plant should be provided, and it recommended that the Council should apply to the L.G.B. for sanction for immediate expenditure on works extension and provision of plant, at an estimated cost of £73,500. After a long discussion the matter was referred to a Special Committee for consideration.

Bradford. — Wages. — The Bradford Corporation Employés' Joint Sub-Committee, which represents nearly 4,000 employés of the municipality, has put in an application for an advance in wages for the members of certain Trade Unions, including the Electrical Trade Union and the Amalgamated Society of Engineers. The demands are for an advance of 100 per cent. on pre-war rates, equal rates for men and women on similar classes of work, and time and a-half for overtime on ordinary working days and double time for Sundays and Bank Holidays. The Special War Wages Committee of the Corporation has already had an application from the tramway workers for an advance of £1 per week on the pre-war rates, and a request for equal treatment of women with men in matters of war bonus.

Bristol.—Street Lighting.—The Sanitary Committee, with the permission of the Chief Constable, has decided to re-light all the arc and half-watt lamps and the electric incandescent lamps; the top halves of the lamps will be painted a dark colour, and the bottom halves with one coat of white paint. In the event of an air raid over Bristol the supply will be cut off at the power station for these lamps, together with all other electric lighting in the city. The number of arc and half-watt lamps at present unlighted is 258, and of incandescent lamps 937.—*Bristol Times and Mirror.*

Burnley.—The electrical engineer reports that he has informed the Todmorden authorities that the supply of electricity in bulk to the latter town was not feasible at the present time.

The Electricity Committee has sent a resolution of protest to the Coal Controller on the unfairness of making the recent advance in the price of coal retrospective.

Burton-on-Trent.—Price Increase.—The price of current is to be increased by 10 per cent. from the quarter ending December 31st.

Canada.—According to the financial Press, the Ontario Hydro-Electric Commission, which recently bought out the Ontario Power Co., is also seeking to purchase the Electrical Development Co. and the Canadian Niagara Co., the other generating companies on the Canadian side of Niagara River. Such a purchase would also involve the acquisition and operation of the Toronto Railway Co. and the Toronto Electric Light Co. in the one case and similar utilities in the city of Buffalo. It is suggested that even the purchase of these undertakings would not enable a sufficient margin of power to be obtained to meet the requirements of the Ontario Commission's customers.

Carlisle.—A supply is to be given to the works of Messrs. T. Brown & Co., and, subject to sanction, a loan is to be applied for to cover the cost of cables.

Continental.—Sweden.—According to a recent statement in the Swedish Press, the Stockholm Waterfall Board has asked the Government for a grant of 4,000,000 kroner, of which amount 3,000,000 kroner are to be used for the power station on the Lulea River, and 1,000,000 kroner for regulating the water supply in certain lakes.—*Board of Trade Journal.*

Edinburgh.—The annual inspection of the Corporation electric generating stations took place last week, the North British Rubber Co.'s works being also visited. At the subsequent dinner, the convener stated that if there were no lighting restrictions they would be running dangerously near the limit of their plant capacity; they were anxious as to the new Portobello station, without which they could not supply a tramway load. It has been decided to recommend an increase of ½d. per unit in the lighting rate, making 3½d. per unit.

Greasborough.—Prov. Order.—The U.D.C. has given notice of its intention to apply for a prov. order to supply electricity in the area for lighting and power purposes.

Halifax.—Prov. Orders.—A special meeting of the T.C. is to be called to authorise an application for prov. orders to enable supply to be given in the urban districts of Mytholmroyd and Luddenden Foot.

Hebden Bridge.—At a Council meeting, last week, it was stated that arrangements were nearly complete for the supply of electricity from Halifax to supplement the local production.

Holmfirth.—The U.D.C. has considered a report by its electrical engineer, and a Sub-Committee has been appointed to consider an extension to Somerfield.

Kingston-on-Thames.—At a recent meeting of the T.C., a recommendation of the Lighting Committee to increase the salary of the chief assistant electrical engineer, met with considerable opposition, one reason being the financial position of the undertaking.

The electricity accounts for the past year show a net loss of £6,790, which is equivalent to an 8d. rate.

Leeds. — Industrial workers—especially women—are demanding, through the Trades and Labour Council, better street lighting, and a deputation has been appointed to wait upon the Chief Constable.

Leicester.—New Power Station.—The T.C. has unanimously adopted a report by the Electricity Committee, recommending that an application be made to the B. of T. for a provisional order authorising the purchase of 36 acres of land on the Aylestone Road for the construction of a new generating station, together with buildings, plant, &c., as may be necessary. Ald. Flint, in moving the adoption of this report, said their generating plant was working at its full capacity, and it was necessary to take the earliest opportunity of meeting the growing demand for electricity. It was probably well known that outside interests were waiting to come into Leicester, and if the Council did not take advantage of the opportunity which presented itself, it might be lost in the future. He did not anticipate any opposition from the Gas Committee, seeing that the Electricity Committee would probably become its best customer.

Mr. C. H. Wordingham, who has reported on the matter to the Council, addressed the latter, pointing out the desirability of commencing the work as soon as possible, and the advantage of co-operation between the electricity and gas undertakings in the interests of fuel economy. He pointed out the necessity of unifying the present diverse systems of supply, and the advantages of a single power station for all purposes.

Lewes.—Street Lighting.—The T.C. has sealed an agreement with the Electric Supply Co. for the supply of current for street lighting.

London.—Marylebone.—The general manager's report on the working of the electricity department for the June quarter shows that 3,598,200 units were sold, representing a net increase of 13·25 per cent. over June, 1916. The net revenue from the sale of electricity and meter rentals amounted to £33,730, being an increase over that of last June of £1,782. The total expenditure for the quarter amounted to £19,093, an increase as compared with the June quarter, 1916, of £1,812. The total average costs per unit sold were 1·274d., as against 1·305d. for the previous June quarter. The net results of the quarter's trading is that the surplus realised towards the payment of the capital charges amounted to £17,522, compared with £17,945 at June 30th, 1916, a decrease of £423 ; but as these charges for the current year are estimated at £1,400 less than last year, the position is well in hand and the estimates have been more than realised.

Hampstead.—Electric indicators to give air warnings, showing "take cover" and "all clear," have been attached to certain lamp standards, these being operated from a central control point.

Manchester.—Preliminary notice of a further increase in electricity charges has been given. It is expected that the new prices will become operative from next December quarter-day.

Marsden.—Prov. Order.—The U.D.C. has decided that consent be given to the granting by the B. of T. of a prov. order authorising the Electrical Distribution of Yorkshire, Ltd., to supply electricity within the urban district, subject to a clause being inserted having regard to prices to be charged to consumers, the laying of cables underground, and a time limit for having the supply available.

Rochdale.—Price Increase.—The T.C., last week, decided to advance the charges for electricity from November 14th as follows :—Lighting 33⅓ per cent., instead of the existing 25 per cent. ; power over 15-kw. demand, advance of ·04d. per unit, under 15-kw. demand advance of ·4d. per unit, instead of ·3d. per unit ; tramways, advance of ·25d. per unit in place of the existing ·15d. per unit. Councillor Walker stated that the additional cost of coal of 2s. 6d. per ton and the increased wages of employés, made an extra amount required of £3,542, and the advanced charges are expected to realise £2,964, leaving a deficiency of £600.

Rotherham.—Linking-up.—At the Electric Lighting Committee, it was reported that a conference had been held with representatives of the Sheffield Corporation to discuss the question of linking-up the power stations at Sheffield and Rotherham as desired by the Ministry of Munitions. The conference decided to recommend to each authority the desirability of linking-up the two power stations, and instructed the respective engineers to meet and endeavour to agree to a tentative scheme to carry this into effect, such scheme when arranged to be submitted to the respective Electricity Committees for consideration.

Spenborough.—Bulk Supply.—The Electricity Committee has decided to recommend that an agreement be entered into with the Yorkshire Electric Power Co. for a supplementary supply of current from its system, subject to the sanction of the B. of T. to the necessary expenditure on a transforming plant.

Stafford.—The Electricity Committee reports an increase last year of 24·2 per cent. in the output of electricity.

Todmorden.—Price Increase.—The Electricity Committee has decided to increase all charges 10 per cent., with a flat rate of 5d. per unit for lighting.

Wakefield.—Price Increase.—As from December 1st next, the price of electricity for power purposes will be advanced 25 per cent. over the current prices, and for lighting purposes 12½ per cent. over the current prices.

York.—Price Increase.—The Electricity Committee has decided to increase the charges for power to consumers by 10 per cent. from January 1st next year.

TRAMWAY AND RAILWAY NOTES.

Belfast.—Traffic Figures.—The total revenue of the tramways for the six months ending September 30th was £166,571, as against £151,981 for the corresponding period last year, an increase of £14,590. The expenditure reached the alarming total of £107,070, as against £89,723, an increase of £17,347. As a result, the gross profit was reduced to the extent of £2,757, or to £59,501, as against £62,258. Net revenue and appropriation charges totalling £59,186 reduced the gross profit to the figure of £316, or £3,567 less than the surplus, £3,883, for the first six months of last year. The increased expenditure on revenue account was :—Traffic, £9,142 ; repairs and maintenance, £3,573 ; power, £4,542 ; and general expenses, £90. The first item was chiefly attributable to increased wages, the second to the same and cost of materials, and the third to the high price of electricity.

Birmingham.—The Corporation has decided to promote a Bill in Parliament for, among other things, the construction of a short length of tramway from Longbridge to Rubery, on the outskirts of the city, where there has been great industrial development.

Dudley.—Accident.—A serious accident, which happily did not result in any loss of life, occurred last week. A fully loaded car was proceeding down the Bath Hill when the driver, who was a learner, lost control, the vehicle running away and colliding at the bottom with another car. Both cars were very badly damaged.

Hebden Bridge.—At last week's Council meeting, the clerk reported the willingness of Halifax and Todmorden Corporations and the Hebden Bridge Rural Council to confer with the District Council on the subject of the possibility of joining up the existing tramway system from Halifax to the motor-'bus system at Todmorden, over a mile and a-half of road, which has at present no service, and he was instructed to call a conference at Hebden Bridge.

London.—The London United Tramways Co. has intimated to the districts through which its lines pass that it is going to apply to Parliament for an Act asking to be relieved from the restrictions imposed on the company with regard to fares, so that it can raise them, and also for power to abandon some portions of its lines in Middlesex and Surrey.

Manchester.—Fare Revision.—The City Council has instructed the Tramways Committee to immediately consider the revision of fares. At its last meeting the Tramways Committee decided to leave the matter over pending the report from the Trading Profits Committee as to the amount expected from the undertaking towards the rates. Councillor Fox strongly opposed the increase of fares until it was known what was expected from the department, and said that when the Committee was convinced the undertaking was not paying its way it would be prepared to raise fares, providing it was assured that the money would go into the department concerned, to make up its losses, and not go to saving the rates.

New Zealand.—The report of Mr. C. F. Alexander, manager of the Dunedin City Tramways Department, for the year ended March, 1917, contains the following information :—Total revenue, £79,928 ; working expenses, £43,514, leaving a gross profit of £36,414 ; loan and special charges, &c., amounted to £30,460, leaving a net surplus of £5,954, as compared with £4,840 the previous year. The car-mileage was 1,295,988, a slight reduction on last year's figures. The passengers numbered 15,135,567, an increase of 285,816.—*Commonwealth Engineer.*

Salford.—Fare Revision.—Ald. Linsley, speaking at the Council meeting, said the recent award to tramway workers by the Committee on Production had added to the working expenses of the tramways £140 a week to working employés, and £85 to those serving with the Colours. The Committee was already paying in war bonus awards £434 and £184 respectively, and it was also paying £210 a week to soldiers' dependents, making a total weekly payment of £1,053, or £54,756 per annum. The increased fares were justified, but even if the receipts continued to be satisfactory, and no further burdens were placed on the department, it might not be possible to place any contribution to the reserve and renewals fund, and it might be necessary to ask for help from the rates for the repair of the permanent way.

Wallasey.—Year's Working.—The Corporation tramways had a record year, according to the annual report just issued. The receipts were £78,756, an increase of £4,435: the passengers numbered 15,125,000, an increase of 819,000; and the car-mile earnings were 13·58d. against 12·92d. The additional war bonuses absorbed £1,050, and £2,749 was paid in war allowances. A sum of £8,500 was allocated to the rates, equal to 4d. in the £, and the highest amount yet handed over.

Wigan.—Accident Claims.—Arising out of the accident on the Corporation tramways in July of last year, 17 cases came before the Registrar of the Wigan County Court, in which passengers claimed damages from the Corporation. A test case had already been brought, in which £45 damages was awarded. Ten of the claims were settled, the total payments accepted being £290, as against £410 claimed. In the contested cases the aggregate damages awarded were £490, compared with a total of £642 claimed. A claim of £500 damages was brought before the Under-Sheriff at Liverpool, last week, by another passenger, and it was stated that the Corporation admitted liability. A verdict for £325, and costs, was given.

The T.C. has decided to purchase a number of L.C.C. tramway cars, if suitable. Alderman Fletcher referred to the abnormal demands made by the traffic at week-ends, and said the Committee would pay almost any price for new cars, if such were to be had; 20 months ago they gave an order for some gear and pinion wheels, but they had not yet been supplied.

Wolverhampton.—The Tramways Committee states, in its annual report, that there is an approximate increase per annum of £7,700 for wages and war bonus, £2,000 for petrol, and £2,400 for electricity. The increased cost of running is having careful attention, and, if these high costs are maintained, it will be necessary to raise fares in due course.

TELEGRAPH AND TELEPHONE NOTES.

Telephone Time Service in Switzerland.—Immediately after the outbreak of the European war, the Government of Switzerland suspended the operation of private wireless stations throughout that country. One result of this step was to prevent the receipt of the daily wireless time signals from the Eiffel Tower, in Paris, to the considerable inconvenience of the Swiss watch and clock makers, as well as many other persons who had been in the habit of receiving these signals. In order to remedy this situation, the Federal telegraph and telephone service installed at Berne automatic apparatus, designed by E. Nussbaum, whereby the wireless time signal received by the official station at that place from Paris is conveyed over the telephone lines to telephone subscribers who desire it. This plan has been in operation since May, 1916, and astronomical observations made at the Federal observatory in Zurich show that the accidental errors involved in the transmission of the signal rarely exceed a tenth of a second.—*Telephone Engineer.*

United States.—The U.S. Government has prohibited the exportation of wireless apparatus from the country except under special permit.

CONTRACTS OPEN AND CLOSED.

OPEN.

Aberdeen.—November 19th. G.N. of Scotland Railway. Telegraph material for six or twelve months. Stores Superintendent, 80, Guild Street.

Australia.—Perth.—December 5th. Deputy P.M.G. Telegraph and telephone instruments and parts, also battery material, according to schedule and conditions, a copy of which may be seen at the offices of the Electrical Review, or at the Commonwealth Offices, Australia House, W.C.

December 12th. Deputy Postmaster-General. Switchboards, telephone parts, as per schedule, a copy of which, as well as the contract conditions, may be seen at the offices of the Electrical Review, or at the Commonwealth Offices, Australia House, W.C.

Beckenham.—November 12th. U.D.C. Three months' supply of coal for the electricity works. See "Official Notices" November 2nd.

Bradford.—November 24th. General stores for tramway department for one year. Particulars from Tramway Offices, 7, Hall Ings.

Enniskillen.—December 1st. Sligo, Leitrim & Northern Counties Railway Co. Telegraph material for 12 months. Mr. J. Duff, Secretary, Enniskillen.

South Africa.—November 12th. S. African Railways. 4,466 train-lighting cells. Secretary, Tender Board, S.A. Railway Headquarters, Johannesburg. Specifications may be seen at the Department of Commercial Intelligence, 73, Basinghall Street, London, E.C. 2.

Wakefield.—November 17th. Coal for electricity works at Calder Vale for one year. City Electrical Engineer, Old Town Hall.

CLOSED.

Halifax.—The Electricity Committee has accepted the offer of Messrs. Bayliss, Jones & Bayliss, Ltd., to purchase the 750-kw. direct-coupled Bellis engine and the E.C.C. dynamo at the electricity works, Halifax, subject to the firm being able to obtain the sanction of the Ministry of Munitions to such purchase, for £2,500.

London.—Marylebone.—The Electricity Committee recommends that the offer of the B.I. and Helsby Cables, Ltd., to extend their contract for a further period of six months subject to an increase of 10 per cent. on the prices contained therein, be accepted.

Stepney.—The Electricity Committee has accepted the offer of Messrs. W. H. Bowater, Ltd., to store at Griffith's wharf 2,000 tons of nutty slack, at 25s. 6d. plus rent for storage, 1d. per ton per week, the Council to insure against fire.

Pipe &c., covering at Limehouse Station:—

Hobdell Way & Co., Ltd., accepted, £80.
Reid McFarlane & Co., £98.
Thermofelt, Ltd., £127.

Sheffield.—Town Council. Accepted tenders in connection with the erection of the emergency power house at Blackburn Meadows:—

John Greenwood.—Buildings.
Gilbert, Heathcote & Co.—Structural steelwork.
Clarke, Chapman & Co., Ltd.—Electric capstans.
Crompton & Co., Ltd.—Boosting sets.

Wolverhampton.—Corporation Electricity Committee:—

Ferranti, Ltd.—H.T. switch cell for Sunbeam sub-station, £130.
Electric Construction Co., Ltd.—Seven motors and switchgear for driving fans and auxiliary plant, £333.
Melville Dundas and Whitson.—Second half of boiler house structure and other buildings, also reinforced concrete hopper for additional telpher plant, £3,500.
Felt & Farrant Manufacturing Co., Ltd.—Comptometer type calculating machine, £73.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, November 9th. At 8 o'clock, at 39, Victoria Street, S.W., paper on "Precision Gauges," by Mr. H. J. Rickwood.

Physical Society of London.—Friday, November 9th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary meeting.

Institution of Electrical Engineers. (Birmingham Local Section.)—Wednesday, November 14th. At 7 p.m. At the University, Edmund Street. Chairman's inaugural address.

(Western Local Section.)—Monday, November 12th. At 7 p.m. At the South Wales Institute of Engineers, Park Place, Cardiff. Chairman's inaugural address.

(Manchester Local Section).—Tuesday, November 13th. At 7 p.m., at the Engineers' Club. Chairman's inaugural address.

(Scottish Local Section).—Tuesday, November 13th. At 7.30 p.m. At 207, Bath Street, Glasgow. Chairman's inaugural address.

Greenock Electrical Society.—Thursday, November 15th. At 7.45 p.m. At 22, West Stewart Street. Paper on "Telephone Switchboard Multiple," by Mr. A. Pick.

Institution of Mechanical Engineers.—Friday, November 16th. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. Paper on "Some Notes on Air Lift Pumping," by Mr. A. W. Purchas.

Electro-Harmonic Society.—Friday, November 16th. At 6.15 p.m. At the Holborn Restaurant (Venetian Chamber). Concert (ladies' night).

NOTES.

Volunteer Notes.—County of London Volunteer Engineers (Field Companies).—Headquarters, Balderton Street, Oxford Street, W. 1.

Orders for the week, by Lieut.-Colonel C.B. Clay, V.D., commanding:—
Officer for the Week.—Second Lieut. E. A. Ullmann.
Drills.—Week ending Saturday, November 17th, 1917:—
Monday.—No. 3 Company, Left Half. Recruits, signalling, 6.30.
Tuesday.—Physical drill and bayonet exercise, 7.30.
Wednesday.—No. 1 Company, 6.30.
Thursday.—No. 2 Company, 6; signalling, ambulance, 6.30.
Friday.—No. 3 Company, Right Half. Recruits, 6.30.
Saturday.—Inspection of N.C.O.'s and men in Sections A, B, and C by a Staff Officer from G.O.C. All N.C.O.'s and men in these sections are required to parade at Headquarters at 2.30 p.m. Uniform.
Note.—The Medical Officer will attend for examination of recruits, &c., on Thursday, at 6.
All enamelled cap badges must be returned to the Quarter-Master Sergeant without delay.
Unless otherwise indicated, all drills will take place at Headquarters.

(By order) Macleod Yearsley, *Capt. and Adjutant.*

Appointments Vacant.—Charge engineer for the Farnworth (Bolton) U.D.C. Electricity Works; instructor in electrical engineering in connection with the training of discharged disabled sailors and soldiers for the County of Barnsley Education Committee Technical School; engineer for testing and calibrating switchboard instruments for the L.C.C. Tramways Department; shift engineer (70s.), station attendant (47s.), for the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board; two charge engineers for the City of Worcester Electricity Works; assistant mains superintendent (50s.) for the Borough of Rochdale Electricity Department. See our advertising pages to-day.

Educational.—Stoke-on-Trent.—The Corporation has appointed for the Central School of Science and Technology a principal of electrical and mechanical engineering, at a salary of £750 per annum. The directors of the Shelton Iron, Steel and Coal Co. have offered to contribute £100 towards a fund for research work.

Institution and Lecture Notes.—Greenock Electrical Society.—The programme of the Society for the coming session is as follows :—

October 18th—Social and whist drive.
November 1st.—Discussion on "Modern Generation and Distribution Systems," by Messrs. Angus and Macdonald.
November 3rd.—Visit to Coplawhill Tramway Works.
November 15th.—"Telephone Switchboard Multiple," by A. Pick.
November 29th.—Open night for discussion.
December 6th.—"Wireless Installation," by G. Reid.
December 15th.—Visit to Glasgow Central Station.
December 20th.—Discussion on "Fuses and Circuit Breakers," Messrs M'Dougall and Toppin.
January 10th, 1918.—"Small Private Plants," by G. T. Morrison.
January 15th.—Visit Globe Sugar Refinery.
January 24th.—"D.C. Machine Faults," by J. A. Kinnaird.
February 7th.—"Armature Winding," by W. R. Scott.
February 21st.—"Notes on Electric Furnaces," by F. H. Whysall.
February 23rd.—Visit to Merino Mill.
March 7th.—Juniors' night.
March 21st.—"Production of Iron and Steel," by A. Norwell.
March 28th.—General meeting.
March 30th.—Visit M'Alpine's Lead Works, Govan.

Institution of Electrical Engineers.—The first ordinary meeting of the session of the WESTERN LOCAL SECTION will be held at Cardiff, on Monday, November 12th, when the chairman, Mr. R. Howard Fletcher, will deliver his inaugural address. The annual general meeting is provisionally fixed for March 11th, at Bristol, and it is proposed to invite Messrs. P. N. Bircham and I. Jorgensen to read a paper on "Electroculture" on that occasion.

The advance programme of the session of the SCOTTISH LOCAL SECTION, so far as decided, is as follows :—

November 12th (Glasgow).—Chairman's inaugural address, Mr. A. Page.
December 11th (Glasgow).—"Gas-Firing Boilers," by T. M. Hunter.
January 8th (Edinburgh).—"Electric Cooking as Applied to Large Kitchens," by W. A. Gillott.
February 12th (Glasgow).—Kelvin Lecture. "Kelvin as a Teacher," by Prof. Magnus Maclean.
March 12th (Edinburgh).
April 9th (Glasgow).

The opening meeting of the session of the MANCHESTER LOCAL SECTION will be held next Tuesday, at 7 o'clock, at the Engineers' Club, Albert Square, when Mr. C. J. Beaver (the chairman) will deliver his address. Other arrangements for the session are as under :—

November 27th.—"Gas-Firing Boilers," by T. M. Hunter.
December 11th.—"Electrical Cooking as Applied to Large Kitchens," by W. A. Gillott.
January 15th, 1918.—"Electrical Signalling and Control on Railways," by C. M. Jacobs.
Other meeting dates are :—January 29th, February 12th and 26th, March 12th and 26th, and April 9th.

Junior Institution of Engineers.—The annual general meeting is to be held at the offices, 39, Victoria Street, London, S.W., on Monday, November 26th, at 7.30 p.m. A paper by Mr. D. C. Boyd on "Die Making, Press Tools, and Tin-box Manufacture" will follow.

The report of the Council for the past year shows that the membership at September 30th was 1,306, a decrease of 23. Of the members serving with the Forces, 19 have been killed in action; 257 are in service. In the November issue of the *Journal*, an illustrated paper on "Mechanical Artificial Arms," by Mr. E. W. Hobbs, is printed.

Institution of Mechanical Engineers.—The Thomas Hawksley Lecture on "Heat Engines," by Captain H. Riall Sankey, C.B., R.E., will be delivered on Friday, November 30th, at 6 p.m., at the Institution of Civil Engineers.

Royal Society.—The following have been recommended by the president and Council of the Royal Society for election at the anniversary meeting on November 30th :—President, Sir Joseph Thomson; treasurer, Sir Alfred Kempe; secretaries, Prof. A. Schuster and Mr. W. B. Hardy; foreign secretary, Prof. W. A. Herdman.

Rontgen Society.—The subject of Capt. G. W. C. Kaye's presidential address delivered on Tuesday evening was "The Part Played by X-rays in the War."

To-morrow, at the Swansea Public Library, Mr. A. J. Stanton, A.M.I.E.E., is giving an address, with lantern demonstrations, on "Organised Effort."

The Effect of the War on Municipal Engineering and Public Health.—In association with the Chadwick Departments of Municipal Engineering and Hygiene, an introductory lecture was given at University College, London, by Mr. H. Percy Boulnois, M.Inst.C.E., on this subject. Mr. Boulnois said it was doubtful whether the general public fully appreciated the important bearing which municipal engineering had upon their daily life and health. The war had, perforce, stopped a number of municipal works which were in process of construction, but all the obligations arising out of the war had been in nearly all cases satisfactorily settled without recourse to the Law Courts. That was entirely due to the good feeling which existed between the contractor and the local authority owing to the crisis into which this country had been plunged. With regard to any detrimental effect upon public health, he did not think, so far as he could ascertain, that up to the present time there had been any such effect due to the compulsory closing down of these works. He doubted if the general public realised the amount of quiet and unostentatious work that had been carried out for their benefit owing to the momentous changes produced by the war. Nor must it be forgotten that this work had been carried out with greatly depleted staffs. With regard to street lighting, the lecturer said there was now more light thrown on the surface of the streets without showing more light upwards, by means of more scientific darkening of the lanterns, and by reducing the candle-power of the burners. He thought the darkening of our streets would lead to a much more scientific arrangement with regard to street lighting. Street lighting was, as a rule, unscientifically considered. "You want," he said, "to diffuse light. Now you have a diffused light—just what is really wanted." On the question of housing, Mr. Boulnois decried State aid as contrary to the principles of political economy, and advocated the promotion of some form of legislation to compel all employers to provide accommodation for their employés, if no other means were available.

Sir Maurice Fitzmaurice, in proposing a vote of thanks to Mr. Boulnois, said the subject with which the lecturer had dealt was really almost a part of the very important subject of Reconstruction. He thought there were very few who really realised what the great extent and cost of reconstruction was going to be after the war. Let them consider the reconstruction which would be necessary on the railways in this country, the Overseas Dominions, and all foreign countries, the roads, water supply, drainage, housing, new works for electric lighting and power, development of our agriculture and of all our natural resources—all these things were going to cost money. Particularly in municipal matters it would be very important that we should make up for lost time. London, perhaps, was better off than most municipalities in that way, but, to mention only one glaring thing in London, their supply of electric current for lighting and power, split up, he thought, among 28 different stations, was, in his view, a perfect scandal to the country.

Empire Trade Organisation: the Australian Scheme.—The London newspapers have published dispatches from Australia summarising a scheme unfolded by Mr. Hughes, the Australian Prime Minister, on Monday last, for organising industry in readiness for after-the-war operations and competition. Mr. Hughes sees that there will be a great economic struggle between the nations, and that industrial upheavals—possibly financial chaos—will result, with vital effects for the British Empire. It is therefore essential for the nation to organise, so as to bear the burdens imposed by the war and so as to deal with the many inevitable and complex problems. The speaker gave in outline his proposals for setting up a great national organisation for Australia. Each industry must have its own organisation, and there must be a general Council of Commerce composed of representatives of these separate Associations. Other parts of the scheme include the appointment of a Minister of Commerce, the setting up of a permanent Science and Industry Bureau, also a Department of Trade, and the appointment of trade representatives in the Overseas markets. There would thus be one Federal Department which would overlook such matters as scientific production and would study possible markets. Even at a cost of £250,000 per annum such an organisation would be well worth while. He emphasised the need for collective action in place of our past individualist policy.

Engineers' Wages.—The Committee of Production has issued an award giving a further advance of wages to all grades of workmen engaged with members of the Engineering Employers' Federation, bringing up the total war-time increase to 20s. per week.

Electrical Rain-Making in Australia.—According to the *Sydney Sunday Times*, the first official news of the success of Mr. Balsillie's efforts to induce rainfall was given to the public by the Minister for Works and Railways (Mr. Watt) on his return to Melbourne from a trip along the route of the Transcontinental Railway. In a brief statement which he made to the Press, the Minister said that after a visit to Bookaloo, and an examination of the records obtained, he was much struck with the results of the experiments, and was satisfied that the tests should be taken further. He had, therefore, decided to install two other stations—one in New South Wales and one in Victoria.

What the Minister learned on his visit to the plant at Bookaloo was that the rainfall was 50 to 70 per cent. above that of the surrounding country, and the area affected by the operation of the plant appeared to be approximately 350 sq. miles.

While Mr. Watt, by reason of his position as a Minister of the Commonwealth, has to take a conservative view of the experiments, others who have only themselves to please in the matter have expressed themselves satisfied with the results obtained by Mr. Balsillie, and have given him orders to install rain-making plants on their stations in the arid districts of Australia. Mr. Balsillie has entered into a contract that he is only to be paid by results. The more rain there is over the average yearly fall, the bigger will be the cheque at the end of the term.

The scheme has been protected in every country in the world, with the exception of Germany and the nations allied with her.

Careful research showed the inventor that in fine weather there was a charge of positive electricity in the higher regions of the air, and that when it rained negative electricity predominated. He was studying the effects of mountains on rainfall, and came to the conclusion that hills acted as conductors of the negative electrical energy with which the earth's surface is charged. He argued that all that was necessary, therefore, to give flat plains the same advantage as regards rainfall as hilly country, was the free passage of the negative electricity to the higher regions of the air. His rain-making plant now consists of a set of two or three kites, which are let up on galvanised flexible wire to an altitude of between 4,000 and 6,000 ft. The negative current is taken from the earth by means of a terminal, which is well grounded. Of course, the first essential in the business is wind. In his tests at Bookaloo and elsewhere, Mr. Balsillie has found that rain invariably falls after the kites have been in the air for from six to ten hours.

In addition to the testing station on the Transcontinental Railway line, another station is being established in the Northern Territory for Government experimental work.

Patent Law.—At the opening meeting of the London Section of the Society of Chemical Industry on Monday, a paper on patent law and British chemical industry was read by Dr. F. W. Hay, patent expert of British Dyes, Ltd., who expressed the view that the novelty of all inventions to be protected by patents should be investigated by the Patent Office by means of a general system of examination, covering all prior British and foreign publications. He further proposed that the public should be allowed five years within which the patent could be revoked on various grounds, and the validity of the patent should then no longer be open to attack in Court, so as to give greater security to any new manufacture depending on patent rights. He also suggested that all actions connected with infringement of patent rights should be tried in the presence of a technical jury consisting of experts engaged in the industry or science to which the action related, the Judge being required to submit the issue of infringement to the jury.—*Morning Post.*

Wages of Australian Tramway Men: Arbitration.—Australian papers just to hand show that in August last arbitration proceedings were commenced by Mr. Justice Higgins respecting the claim of the Australian Tramway Employés' Association against tramway companies and others in the various States seeking increased wages and better conditions of work. The respondents who put in an appearance were the Prahran & Malvern Tramway Trust, the Hawthorn Tramway Trust, the Melbourne, Brunswick & Coburg Tramway Trust, the Hobart Council and the Kalgoorlie Electric Tramways, Ltd. It was announced that agreements had been signed and the plaint withdrawn as against the Melbourne Tramways Board, the North Melbourne Electric Tramway & Light Co., the Electric Supply Co. of Victoria, the Northcote Council, the Fremantle (W.A.) Municipal Tramway & Electric Light & Power Co., which were amongst the original respondents. The Association made the following claims, amongst others, for wages:—Shunters, dray drivers, orderlies, lavatory men, office porters, and labourers, the basic rate of 11s. a day; horse car drivers, 11s. 6d. a day; conductors, tramcar drivers, signalmen, 12s. 6d.; signalmen in charge of levers, 13s.; engine drivers, 13s. to 17s.; firemen 13s. to 13s. 6d.; trimmers, boiler cleaners, 12s.; and other classes of workers from 12s. to 15s. a day. Employés at Kalgoorlie asked for 15 per cent. above these rates. A 44-hour week was asked for in the plaint, but it was stated that the employés would consent to a 48-hour week. Annual leave was asked for by the employés of 21 days each year on full pay. It was stated that agreements had been come to with many of the respondents in respect to various conditions of work to be performed by the employés, and that understandings on other points might follow. In answer to his Honour, several of the respondents declined to admit that there was a dispute extending beyond the limit of one State, and it was intimated that this matter would have to be determined latter on in High Court jurisdiction.

The taking of evidence was commenced.

Technical and Commercial Libraries.—The interim report of the Council of the Library Association on the Provision of Technical and Commercial Libraries has been issued, and includes the following recommendations, which have been laid before the Department of Scientific and Industrial Research:—

(*a*) The removal of the existing limit to the library rate, so that local authorities may be free in future to expend upon their libraries the sums necessary for their greater efficiency.

(*b*) A closer union between State and Copyright Libraries on the one hand and Municipal Libraries on the other, so that the resources of the former may directly or indirectly be made available for scientific and technical students in the provinces.

(*c*) That funds should be provided for some State-supported library, such as the Science Library of South Kensington, or a library controlled by the Department of Scientific and Industrial Research, to purchase books required for research, and to make them available for loan to public libraries.

The Association is of opinion that it is of urgent national importance to increase the supply of scientific and technical books and periodicals as suggested in paragraph (*c*), and that local authorities should afford more generous support to public libraries for the provision of scientific and technical literature. Commercial departments should also be established in libraries in trading and industrial centres, and special collections of books brought together and classified. The co-operation of the B. of T. Commercial Intelligence Branch to this end is suggested, and the valuable services rendered to American commerce by the Philadelphia Commercial Library, which answers inquiries on trade matters by telephone and correspondence, are cited as an example of what should be done here. But Library Committees must be prepared to pay higher salaries to assistants capable of doing such work. We are glad to see that the Association holds such advanced opinions, with which we cordially agree, and it is taking steps towards realising the proposals above described.

Storage of Coal (in Bulk).—The British Fire Prevention Committee has issued a special "Warning" (No. 31) with regard to the storage of coal in bulk, with especial reference to spontaneous combustion. The following are some of the precautions that should be taken:—

(*a*) Stacks should not be higher than 10 ft.

(*b*) Iron perforated pipes 3 or 4 in. in diameter, or, failing these, either suitable earthenware pipes or ducts formed of incombustible material should be inserted vertically in the stacks as they are built up. The lower ends of these pipes or ducts should be at different heights from the ground throughout the stacks. There should be one pipe or duct to about every 300 sq. ft. of surface.

(*c*) A thermometer should be lowered occasionally through these pipes or ducts to ascertain the temperature at the centre of the stack.

(*d*) If wet, very small, very soft, or impure coal is received, it should be dumped around the edges of the stack, or in some location where the air can get to it freely, and where other coal will not be packed on top of it.

Matches should always be used carefully, and should not be thrown down until extinguished. Safety matches are preferable to any others. The funnels of steam lorries, &c., should be fitted with spark arresters, and similarly the flue pipes to any stoves near the coal stacks.

When a coal yard is working at pressure, more than ordinary care should be taken to keep the premises clean, and to see that there is no accumulation of waste or rubbish. Oily rags from lorries especially should be placed in iron or metal-lined receptacles, and removed every night. Particular care should be taken to guard against any hot ashes from steam lorries, or accumulation of petrol or oil drippings from motor vehicles generally.

Fire appliances should be installed, and properly overhauled weekly by a competent employé or watchman, and kept ready for instant use. Additional fire appliances above the usual supply should be provided where the pressure of work is exceptional. In large yards hydrants with an ample supply of hose to cover the whole of the premises should be provided. Particular care should be taken in frosty weather to prevent mains, hydrants, or hand fire appliances being affected.

Coal should not be stacked against buildings, boundary walls, or wood fences, &c., as the pressure may be considerable, and such structures collapse with serious results.

Buckets of water should always be available, also buckets or bins of dry sand with scoops where oil or spirit is used.

Copies of the notice can be obtained on application in writing to the Registrar at the offices of the Committee, 8, Waterloo Place, Pall Mall, London, S.W. 1, enclosing a stamped addressed foolscap envelope.

Electro-Harmonic Society (Season 1917-1918).—The next Concert (Ladies' Night) will held at the Holborn Restaurant, in the Venetian Chamber, on Friday next, November 16th, at 6.15 p.m. Colonel A. M. J. Ogilvie, C.B., will preside. The list of artistes is as follows:—Miss Annie Rees, soprano; Miss Dorothy George, contralto; Mr. Thomas Howell, baritone; Mr. Walter Churcher, humorous recitals; Mr. Arthur Brough, ventriloquist and child mimic; Miss Rene Haslam and Mr. Fred Rome, cameo conversations; Mr. Ernest Hastings, entertainer at the piano; Mr. Bernard Flanders, A.R.A.M., pianoforte solo and accompanist.

Automatic Railway Sub-Stations.—A recent article in the *Electric Railway Journal* mentioned that a dozen or more automatic sub-station equipments have been installed by seven different electric railways in America, and some 30 other equipments are under construction by a single manufacturer. The apparatus is designed to do the work of the operator, and, in addition, automatically to limit the amount of current taken from the machine.

This portion of the equipment consists of a load-limiting resister, which is automatically inserted between the machine and station bus when excessive peaks occur by reason of high acceleration, &c.; where individual feeder protection is required, a portion of the resistance is inserted in the outgoing feeders. Equipments are under construction for automatic stations ranging from 200 to 1,500 KW. It is calculated that in the case of a hypothetical line having four sub-stations of 300 KW. capacity each, and operating a car service on a 2-hour headway, the total saving per year would amount to $6,608 (£1,321), comprising $4,680 (£936) wages and $1,928 (£386) energy. One day and one night inspector only would be required to supervise the equipments; in the case of the Des Moines City Railway it is considered that these two officials will have ample time to look after the operation of the 16 automatic converter stations eventually to be installed, which, in view of labour shortage, should be especially attractive to the company.

Causes of German Coal Shortage.—The *Labour Gazette* states that the chief causes of the present inadequate output of coal in Germany are discussed in an article in *Die Konjunktur* of August 30th:—"Among those given are the underfeeding of the miners, their lack of experience and training, the unsatisfactory terms of the collective piecework contracts, lack of zeal in the workers, defective ventilation, poor blasting materials, defective tram lines, and general shortage of trams, timber and other materials. By way of illustrating the decline in the standard of efficiency of the mining staffs, the following figures are given: At the outbreak of war the Prussian mines had at their disposal a total of 767,177 fairly well-trained workers, of whom 7,205 were women and 31,290 were lads under 16. In the first quarter of 1917 the total number of workers in the Prussian mines (exclusive of prisoners of war) was 593,722, of whom 40,842 were women and 41,197 lads under 16. Thus the percentage of women and lads had risen from 5·02 to 13·82. During the second quarter of 1917 the total number of workers has increased somewhat, and if prisoners of war be included, it falls but little short of the peace-time number. Thus there is quantity, but not quality. At the present time quite one-sixth of all employed in and about the mines are made up of women and lads, lacking both in physical strength and in training. But even among the men a large proportion are unskilled people, recruited from every conceivable vocation. If the prisoners of war be included, the effect is to reduce the average efficiency of the mass still further."

Co-operation in Export Trade.—The club dinner of the Engineers' Club, Manchester, held on Tuesday last, was followed by a debate on "Co-operation in Export Trade." Captain L. E. Mather presided, and the debate was opened by Mr. L. A. Paish, of the Department of Commercial Intelligence, who recently addressed the Birmingham Brass Masters on the subject of trading combinations.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Mr. HOWARD FOULDS, having accepted an appointment with an electrical company in London, has resigned the secretaryship of the Birmingham Corporation electricity supply department. The Committee has appointed a sub-committee to consider the appointment of a successor as from the beginning of the New Year. Mr. Howard Foulds has been secretary of the undertaking for the past seven years. The Committee adopted, at its last meeting, a resolution expressing regret at Mr. Foulds's severance from the work in Birmingham, and its high appreciation of his services to the department.

West Ham E.L. Committee recommends that the undermentioned officers be granted an increase of 15 per cent. on their pre-war salaries as under (less any merit increases which have been granted since the commencement of the war), to date from October 1st, 1917:—Mr. J. Allan, station superintendent, £400; Mr. F. Farndon, sales manager, £400; Mr. W. A. Gilbert, mains engineer, £325; Mr. W. F. Edgerton, assistant sales manager and meter superintendent, £285; Mr. H. Smith, departmental accounts clerk, £240; Mr. H. B. Johnson, chief clerk, £220; Mr. E. Tombs, stores manager, £200 (increased since the war to £220); Mr. G. D. Bendix, assistant station superintendent, £250; Mr. W. Whitney, assistant mains engineer, £215 (increased since the war to £240); Mr. W. S. Cobb, station foreman, £208 (increased since the war to £221). It is further recommended that the following increases be given:—Mr. R. Snell, assistant meter superintendent, from £3 12s. 9d. to £4 2s. 9d.; Mr. H. P. Irons, installation inspector, from £3 2s. 6d. to £3 12s. 6d.; Mr. A. H. Gibbs, jun., assistant timekeeper, from £2 9s. to £2 14s.

Committees of Sheffield City Council favour the following increases in salaries:—Mr. A. R. Fearnley, general manager, tramways and motor department, present salary of £1,000 a year to be raised by two annual increments of £100 each; that the maximum salaries of shift engineers in the electric supply department be increased to £220 per annum; and that the salaries of the following shift engineers be raised by £20 per annum in each case:—Mr. H. Price, present salary £170; Mr. W. H. Smith, present salary £160; Mr. T. Roberts, present salary, £150.

General.—LORD CARMICHAEL, G.C.I.E., K.C.M.G., has accepted a seat on the board of the British Thomson-Houston Co., Ltd.

Mr. J. N. JARDINE, who has taken up a Government appointment abroad, has been presented by the electrical department of Messrs. Bean & Son, Dudley, with a pair of field glasses in leather case.

On the occasion of resigning his position as electrical engineer with the Banknock Coal Co., Stirlingshire, to take up a position in England, Mr. ANDREW WALKER was presented with a Gladstone bag and a wallet containing Treasury Notes as a parting gift from the employés.

From a recent minute of the Sydney Municipal Council it appears that Mr. J. DAVIS, Director-General of Public Works, is about to retire from his present position, with the intention to practise privately as a civil engineer in London. Mr. Davis has served the State for many years. The State Government has arranged with him to inspect and arrange for the importation of machinery and other articles required in connection with the public service of the State, and in respect of his services in this connection payment will be made by commission. The Lord Mayor suggests that the Municipal Council would be well advised to retain Mr. Davis as its representative in Great Britain. The Council at the present time has as its consulting and inspecting engineers for the electricity supply department Messrs. Preece, Cardew, Snell and Rider, and it is not proposed to make any change in this connection. In addition to opening an office in London, Mr. Davis will have assistants in the centres of industry in Great Britain and a representative in the United States, whose services will also be placed at the disposal of the Council.

Mr. J. E. DOBSON, late Scottish representative of Messrs. Bruce Peebles & Co., Ltd., Edinburgh, has been appointed London office manager to the company, in place of the late Mr. R. W. Gauntlett, and has now taken up his new duties at Hastings House, Norfolk Street, Strand. Mr. Dobson's many friends, both in Scotland and elsewhere, will wish him success in his new appointment.

Roll of Honour.—Lieutenant E. G. BAKER, Loyal North Lancs. Regiment, who has been wounded in the head, and is lying in the 2nd Southern General Hospital, Southmead, Bristol, was employed at the Morecambe electricity works.

Sapper A. J. WILLIAMS, R.E., who has fallen in action, was engaged at the works of Messrs. Siemens Bros., Stafford.

Private C. W. TEW, Grenadier Guards, who was engaged in the winding shop at the Stafford works of Messrs. Siemens Bros., has been killed by a shell.

Sapper P. COBB, R.E., who has died from wounds, was in the dynamo shop at the Queen's Engineering Works, Bedford.

Corporal G. H. TOMPKINS, Oxford and Bucks. Light Infantry, who has died of wounds and the effects of gas, was in the Coventry works of the B.T.H. Co.

Lance-Corporal H. L. TENNANT, Lancashire Fusiliers, who has been killed, was employed by Messrs. Davenport, Sparrow and Co., electrical contractors, Manchester.

Private W. E. G. STANLEY, Lancs. Fusiliers, reported killed, was employed at the British Westinghouse Works, Trafford Park.

Private D. GREGORY, Border Regiment, killed in action, was employed by Messrs. W. T. Glover & Co., Ltd., Trafford Park.

Driver J. WARD, R.F.A., killed in action, was employed in the generating station of the Stalybridge Joint Tramways and Electricity Board.

The funeral took place at Darwen Cemetery, on November 1st, of Lance-Corporal J. POOLE, K.O.R.L. Prior to enlistment he was employed at the Blackburn electricity works. The funeral was attended by a firing party of 18 men from Preston. Included in the floral tributes was one from deceased's fellow employés at the electricity works.

Private G. WALTON, of the Australian Force, who has been killed in action, was employed in Australia as an electrician.

Private W. W. HOLEY, Royal Warwickshire Regiment, who has been mortally wounded while serving as a stretcher-bearer, was an electrical engineer, of Whitby.

The following honours have been awarded to the employés of the Stepney B.C. Electricity Committee:—Lieut.-Col. G. G. Ewer (sales engineer), D.S.O.; Lance-Corporal H. O. Hendry (clerk), Military Medal; Sapper E. Jones (showroom assistant), Military Medal. It is feared that Lance-Corporal Hendry has been killed. The Committee has conveyed its congratulations to Lieut.-Col. Ewer and Sapper Jones, and to the father of Lance-Corporal Hendry.

Private J. ANDERSON, formerly an apprentice in the Glasgow Corporation electricity department, has been killed in action.

Private J. S. WEAVER, formerly engaged in the Leeds tramways accounts department, has been wounded.

Corporal J. HYLAND (20), South Lancashire Regiment, has fallen in action. He was employed by Mr. H. Barber, electrical engineer, Birmingham.

Mr. R. H. Dickinson, chief engineer to the Birmingham Corporation tramways, has received official information of the death of his eldest son, the Rev. HARRY DICKINSON, Chaplain to the Artists' Rifles, Vicar of St. Stephen's, Birmingham.

Obituary.—MR. WILLIAM DU BOIS DUDDELL.—It is with the deepest regret that we record the death of Mr. W. Duddell, which took place on November 4th, after a long illness, at the early age of 45. Mr. Duddell was one of our most brilliant and successful investigators, and stood in the foremost rank of British scientific engineers, a position which he won before he was 30. A thoroughly practical engineer and expert mechanician, he designed and made the first successful oscillograph, and thus opened the way to a new mode of observation which has proved of priceless value to the electrical industry. He also studied the physics of the A.C. arc to excellent purpose, and laid the foundation on which the continuous-wave system of wireless telegraphy and telephony was built up. In conjunction with Prof. Mather, he perfected a standard wattmeter, and he devised thermally-operated ammeters of extraordinary delicacy and ingenuity for measuring minute antenna high-frequency currents, &c. His researches in wireless telegraphy were no less brilliant than his other work. Following Dr. Ferranti, Mr. Duddell for two years occupied the chair of President of the Institution of Electrical Engineers; he was past-president of the Röntgen Society, and was appointed a member of the Admiralty Board of Invention and Research, as well as of the Inventions Board of the Ministry of Munitions. He was made a Commander of the Order of the British Empire in August last, and five years ago he was awarded the Hughes Medal of the Royal Society, of which he was a Fellow. He was a member of the Advisory Council for Industrial Research. The full extent of his services to the Institution of Electrical Engineers will never be known except to those who collaborated with him, and during the war he had been engaged upon work of the first importance to the nation. Further particulars of his career will be found in our issue of November 8th, 1912, together with his portrait. By his early decease the electrical profession has suffered a heavy blow; his friends are no less grieved at the loss of his engaging personality and charming courtesy.

MR. W. NOBLE.—Mr. Wilson Noble, formerly M.P. for Hastings, who has died at the aged of 63, was interested in electrical research, and for nine years acted as President of the Röntgen Society of London.

NEW COMPANIES REGISTERED.

Agence Havas (1,621F).—Particulars filed October 15th, 1917. Incorporated in France, July 17th, 1879. News and advertising agency. London addresses:—(Telegraphic information) 24, Old Jewry, E.C., (advertising department) 105, Cheapside, E.C. Directors: J. C. M. Leffitte, H. L. Houssage, J. B. Fairer, C. E. C. A. Houssage, C. A. O. Guistiniani, A. C. Meynot, J. M. Laffitte, F. J. E. Barbier, and E. Lebey, all of Paris. Gustave Hirsch de la Mar, 24, Old Jewry, E.C., and Gaston Poignant, 105, Cheapside, E.C., are authorised to accept service.

Lo-Thermo Patents, Ltd. (148,701).—Private company. Registered October 18th. Capital, £1,000 in £1 shares. To acquire from Electromotors, Ltd., B. Longbottom, and E. Greenhalgh the benefit of certain inventions relating to dynamo-electric machinery, and to carry on the business of electrical engineers and contractors, manufacturers of, and dealers in, railway, tramway, electric, magnetic, galvanic, and other apparatus, &c. The subscribers (each with one share) are:—B. Longbottom, Thornville, Alderley Edge, managing director; E. Greenhalgh, Harewood; Birchfield Road, Rusholme, Manchester, electrical engineer. The first directors are:—W. T. Stubbs, B. Longbottom, and E. Greenhalgh. Registered office: 61, Brown Street, Manchester.

Lincolnshire Motor & Electric Traction Co., Ltd. (148,735).—Private company. Registered October 24th. Capital, £5,000 in £1 shares. Objects, as indicated by the title. The subscribers (each with one share) are:—S. A. Fuller, 13, Abbey Drive East, Grimsby, electrical engineer; C. A. B. Turner, 11, Hainton Avenue, Grimsby, farmer and engineer; N. Green, Holbeck Manor, Horncastle, steam trawler owner. The first directors are:—S. A. Fuller, C. A. B. Turner, and N. Green. Registered office: 5, Wellowgate, Grimsby.

Supply Association Among Metallurgists and Machine Makers (C.A.M.M.) (1,624r).—Particulars filed October 24th, 1917. Registered in Italy. Objects: The direct purchase of raw materials on behalf of associates in Italy and abroad, &c. Capital unlimited. Shares are of lire 100 each nominal value. British address: 26, Portugal Street, W.C.2, where J. H. Pearson, London manager, is authorised to accept service.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Dublin United Tramways Co. (1896), Ltd.—Particulars of £2,600 debenture bonds created August 7th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The undertaking of the company, and all the tolls and sums of money arising by virtue of the Dublin United Tramways Acts, 1881 and 1905. No trustees. Registered October 20th, 1917.

Direct West India Cable Co., Ltd. (53,956).—Capital, £120,000 in £5 shares. Return dated October 11th, 1917. 12,000 shares taken up; £3 15s. per share called up. £45,000 paid. Mortgages and charges: Nil.

Electric Supply Corporation, Ltd. (52,036).—Capital, £250,000 in £5 shares. Return dated July 19th, 1917. 42,500 shares taken up; £175,000 paid on 35,000 shares; £35,000 considered as paid on 7,000. Mortgages and charges: £154,914.

Exchange Telegraph Co., Ltd. (6,152).—Capital, £96,430 in 8,023 "A" shares of £10 each and 16,200 "B" shares of £1 each. Return dated August 10th, 1917. All shares taken up; £64,046 paid, being £10 per share on 6,000 "A" and £2 per share on 2,023 "A"; £32,384 considered as paid, being £1 per share on 16,200 "B" and £8 per share on 2,023 "A." Mortgages and charges: Nil.

Bombay Electric Supply & Tramway Co., Ltd.—Capital, £1,320,000 in 72,000 ord. and 60,000 pref. shares of £10 each. Return dated April 25th, filed October 9th, 1917. 72,000 ord. and 60,000 pref. shares taken up; £10 per share called up on 60,000 pref. and 45,000 ord; £1,049,956 paid, leaving £36 in arrears; £270,000 considered as paid on 12,000 ord. and 15,000 pref. Mortgages and charges: £733,099.

Llangollen and District Electric Light & Power Co., Ltd.—Capital, £6,000 in 3,500 ord. and 2,500 pref. shares. Return dated October 8th, 1917. 2,114 shares taken up; £1 per share called up on 2,114; £2,110 15s. paid, leaving £3 5s. in arrears. Mortgages and charges: £3,000.

Fors Accumulator Foreign Patents, Ltd.—Capital, £3,000 in 952 pref. and 2,048 ord. shares of £1 each. Return dated January 11th (filed August 8th), 1917. 584 pref. and 2,048 ord. shares taken up; £132 paid on 132 pref.; £2,500 considered as paid on 452 pref. and 2,048 ord. Mortgages and charges: £125.

Dublin United Tramway Co. (1896), Ltd.—Particulars of £3,200 mortgage bonds redeemable September 20th, 1922, created August 7th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The undertaking of the company, and all the tolls and sums of money arising by virtue of the Dublin United Tramways Acts, 1881 and 1905. No trustees. Registered October 20th, 1917.

Harry H. Gardam & Co., Ltd.—Mortgage dated October 24th, 1917, to secure £2,500, charged on freehold land and hereditaments at Staines. Holder: J. Ashby, J.P., D.L.

Gavan Inrig, Ltd.—Particulars of £200 debentures created October 11th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Milton Manufacturing Co., Ltd.—Memorandum of satisfaction in full on October 10th, 1917, of mortgage and Land Registry Charge dated December 20th, 1916, securing £2,000, has been filed.

CITY NOTES.

Compagnie Francaise des Câbles Télégraphiques.

The directors report that frequent interruptions occurred in 1916, some of which were at great depths. Six interruptions took place in the cable from Brest to Saint Pierre, two in the case of the Brest-Cap Cod cable, and even a simultaneous interruption in the two cables for 15 days was recorded. During the fine weather it was possible to remove from the Brest-Cap Cod cable a fault which had prevailed at great depths for some years past, and a second existed which still interfered with the handling of the traffic. Notwithstanding these facts, the traffic receipts on the trans-Atlantic cables were higher than those in 1915. In the network in the West Indies the receipts increased in 1915 by 28 per cent. over those in 1914, and in 1916 the augmentation was 20 per cent. over 1915, and 54 per cent. as compared with 1914. The reasons were to be found in the general situation which had caused an expansion in messages, and in the restrictions imposed on the use of codes. In Venezuela, in particular, the receipts experienced a material increase, and the service between that country with external countries was certain and regular, thanks to the new cable between San Domingo and Porto Rico, which had permitted of the doubling of the land line from San Domingo to Puerta Plata, Venezuela, and the Greater Antilles.

The receipts from the land network in the Dominican Republic were slightly less than in 1915, when they were exceptionally high. In this connection, the United States military authorities, who were in occupation of the country, had undertaken the working for their own account of the wireless station at San Domingo, and also for private messages. The company had succeeded, however, through representations made by official circles, in securing the use of the station to be limited solely to the requirements of the military authorities. The company's claims for indemnities arising from the injury caused during the revolutionary troubles in the course of recent years were to be investigated, together with other French claims, by a commission who were appointed this year (1917). The receipts from the cable between New Caledonia and Australia experienced a slight increase, whilst the subsidies and guarantees reached £25,800, as against £25,900 in 1915. The subsidy from Dutch Guyana continued to be received, but great difficulties were met with in obtaining the subsidy due from the Government of Hayti, which was under the financial control of the United States as a result of an agreement concluded in 1915. The arrangement made with the French Minister for the Colonies in regard to the litigation concerning the subsidies of the French Guyana, the Martinique and Guadeloupe, was in course of execution, and the company had received a considerable amount of the subsidies which were in dispute.

The financial benefit derived by the French Government from the free transmission of official messages, which was represented by £37,000 in 1915, rose to £57,000 last year, whilst terminal and transit charges and taxes and other charges yielded a further sum of £29,000 to the State. If the gratuitous forwarding of State messages results in a considerable saving to the Government, the directors recall the fact that the service at the same time increases the company's working expenses and diminishes the capability of transmitting paying traffic. The net profits are returned at £144,000, which sum has permitted of the repayment to the State of £70,000 arising from the debt incurred under the Government guarantee, and the distribution among the shareholders of a dividend of 11.08 fcs. per share, or a total of £23,800 among 53,702 shares of £10 each, the total ordinary share capital being £537,020.

The Zurich Bank for Electrical Undertakings.

The report of the Bank fur Elektrische Unternehmungen, of Zurich, which deals with the year ended on June 30th, 1917, states that the difficulties caused by the war placed an increasingly oppressive burden both on belligerent and neutral countries, and trade and industry in nearly all countries had more and more been devoted to war requirements. As a consequence of their adaptability, the electricity works would have suffered less if constructional and raw materials had not become scarcer and more costly. The unfavourable situation of the works using coal continued, and a considerable increase in the costs had also now taken place, even in those districts where coal mines are to be found. The total result was that it was almost impossible to carry out renewals and extensions, and owing to the great wear and tear brought about the work of replacement would assume considerable dimensions after the war. This state of affairs was already still more noticeable in the case of tramways than in that of the electricity works. The depreciation of money and the dearness of commodities had led to increases in the wages of the employés, which, together with the higher taxes, had prejudiced the financial results, and this would also have to be reckoned with after the war. As a consequence, efforts were being made by the electricity works to obtain an increase in prices, and by the tramway companies in the passenger fares. Of the companies closely associated with the bank, only the Electric Co., which supplied the Roumanian petroleum industry with current, had suffered not inconsiderable material damage through the war, and the hope was expressed that the endeavours to secure compensation would be successful.

The directors refrain from making any definite prediction as to the prospects of electrical undertakings in the near future, although the hope is entertained that the existing difficulties would be overcome in the course of a few years after the termination of the war. The hope also might be cherished that the ratio between receipts and expenditure would again approach normal conditions through a reduction

in the working expenses and an increase in the sale prices for energy, and that this recovery would be facilitated by the constant growth in the use of electric power, since new applications for electricity had been opened up by the war, particularly in the electrochemical department, and especially as it had become generally admitted that small works were not economical, and that they must be connected with large works. All these considerations led to the expectation that undertakings which were sound internally, and established and worked on right principles, would again yield satisfactory results in a few years' time. After giving details of the numerous companies in which the bank is interested in different parts of the world, the directors report that the gross revenue amounted to £395,000, as compared with £459,000 in 1915-16, on an ordinary share capital of £3,000,000. The net profits, after defraying general expenses and interest charges on the loan capital of £3,790,000, are returned at £162,000, as contrasted with £258,000 in 1915-16, and the dividend is at the rate of 5 per cent., as against 8, 8, and 10 per cent. in the three preceding years respectively.

Amalgamated Wireless (Australasia), Ltd.

During the half-year ended at June last the company made a profit of £2,913, to which is added £5,565 brought forward. After paying 5 per cent. dividend and putting £1,000 to marine insurance account, £4?7 is carried forward. The war again prejudicially affected business, the acceptance of messages from the public being practically prohibited. Work in the manufacturing department was plentiful, so as to tax the resources of the company.

The annual meeting was held on August 30th, at Sydney, Mr. E. T. Fisk, the acting managing director, in the chair. The chairman expressed regret at the retirement of Mr. H. R. Denison from the position of managing director, because of the great demand made upon his time by other interests. Mr. Denison was one of the pioneers of wireless development in Australia. For the year, which ended on June 30th last, the profit was £7,453. A 5 per cent. dividend was recommended, and the reserves had increased to £20,500. The company had been able to pay a steady 5 per cent. dividend practically from its inception, in spite of the fact that progress in at least one important direction, that of "message traffic," was impossible during war time. The directors had followed a policy of carefully building up reserves for marine insurance, depreciation, and for patent rights. The position would improve as more of the available resources were employed in extending the company's operations. As a result of the policy of building up the manufacture of wireless telegraph apparatus in its own factory, the company had received some important orders from the Australian and New Zealand Governments. The company had recently gained the position which was undoubtedly unique in the history of Australian manufacture, of receiving a number of orders from England, Africa, India, and other places for the manufacture and export of complete wireless telegraph stations. The company's patent rights were being continually added to by means of the new inventions of Signor Marconi and his associates, all of which belonged, in Australian and New Zealand, exclusively to the company. Among the most recent patents acquired by the company was a new invention made by Marconi which had already been referred to in the newspapers. Only partial particulars had been received at present, and the matter was still confidential, but the invention promised to mark a new epoch in wireless communication equal to that brought about by Marconi's famous tuning invention of the year 1900.

Barcelona Traction, Light and Power Co.

The report for 1916 states that Dr. H. F. Parshall, the president and consulting engineer of the Ebro Irrigation and Power Co. and the Ferrocarriles de Cataluña, S.A., has issued a report showing that substantial progress has been made by the companies operating in Spain, and the results are satisfactory having regard to the conditions under which they were realised. The war makes construction everywhere more difficult and expensive, and this is especially true where a large quantity of the materials has to be brought from overseas. Nevertheless, the works outlined in Dr. Parshall's original report have been substantially completed. The continued high price of coal, however, has necessitated a considerable change of plans, and in view of the rapid growth of business it became necessary for the Ebro Co. to begin the construction of another hydro-electric power plant without further delay. It is not easy at present to raise new capital, but it is satisfactory to report that such financial provision has been made as will enable the Ebro Co. to carry on construction into 1918. Work on the new plant was begun in July last, and is being pushed forward as rapidly as possible. It is hoped that when complete it will furnish sufficient power to cover requirements for a number of years. The net revenue amounted to $1,875,315, against $1,316,282, and the interest on prior lien "A" bonds $331,900, against $96,355, leaving a surplus of $1,543,415, against $1,219,927. The results for the first six months of 1917 indicate a further large increase, and it is anticipated that this rate of increase can be maintained throughout the year. Under the plan approved by bondholders all surplus earnings from operation up to June 1st, 1918, were to be applied to further construction, all bond interest, excepting that on the prior lien "A" bonds, being satisfied by the issue of 5 per cent. notes. As a result no profit and loss statement is published, as all earnings of the associated companies are applied as provided in the committee agreement. The shares in the capital stock of the Tramways de Barcelone purchased by the company are still held as security for the balance of the purchase price, and will probably remain so until after the war. The application for a concession for unification which the Tramways Co. is making is still pending, and the managing director reports that there is reason to believe it will be granted in due course. The tramways earned a surplus over the dividend upon their common shares, which the company guarantees.—*Financial Times.*

Monte Video Telephone Co., Ltd.—After providing for all charges in Monte Video and London, and making provision for income-tax and excess profits duty, the net profit for the year ended July 31st, 1917, is £26,324, against £25,985 for the previous year. The interim dividends paid in May absorbed £4,343, leaving £21,981, plus £5,694 brought forward. After applying £8,000 to depreciation of property and plant, transferring £9,000 to reserve for renewals, and paying final dividends of 2½ per cent., less income-tax, on the preference shares, and 3 per cent., free of tax, on the ordinary shares, making 5 per cent. and 6 per cent. respectively for the year, £6,332 remains to be carried forward. There has again been a satisfactory increase in the number of subscribers during the year.

Norwich Electric Tramways, Co., Ltd.—Dividend, 2 per cent. for the year, placing £8,000 to reserve, and carrying forward £39.

Isle of Wight Electric Light & Power Co., Ltd.—Owing to the reduced profits, the half-yearly preference dividend will not be paid until the results of the complete year are known.

Indian Electric Supply & Traction Co., Ltd.—Interim dividend of 2½ per cent.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets remain quiescent. The news from the Italian front continues to bear rather depressingly upon most departments, the view being, of course, that any serious set-back in that quarter will have the effect, by prolonging the war, of causing fresh expenditure of men, material, and money, and therefore acting as a fresh drag upon the money markets of the world.

Financial conditions are none too comfortable in the United States and Canada at the present time. So far as the latter is concerned, a better tone has supervened within the past few days, and there is rather more support being given to the Canadian industrial concerns, including those of the electric power companies. At home, the tendency is to let prices droop a little in the absence of effective support. It would appear as though the public were refraining from investment just at present, because the returns of the amounts subscribed to the National War Bonds are not as large as might well be expected.

The home railway market is once more on the decline. Underground Electric Income bonds slipped back to 83, and the £10 shares to 35s. Metropolitan Consolidated weakened to 23, and most of the steam stocks are also lower. Meanwhile, the mild agitation continues for a more generous treatment by the Government of the railway stockholders in the matter of dividend payments. One correspondent wrote bitterly to an evening paper the other day, pointing out that on Metropolitan Consolidated his dividend for three years preceding the war was 1½ per cent. each year, whereas since that time he had received only 1 per cent., in spite of the fare-raising which has come into operation.

The London United Tramways Co. announces its intention of applying to Parliament for the right to raise its fares, and for power to abandon some portions of its lines in Middlesex and Surrey. Proprietors will probably be thankful to know that the directors are alive to the necessity for action to pull the company out of its present condition; the 4 per cent. debenture stock last changed hands at 32½ and 33 at the end of October. London and Suburban Traction ordinary are slightly better at 2s. 9d. The preference were done yesterday, Monday, at 7s., and the 4½ per cent. First Mortgage debenture stock at 61¾ and 61. The most recent business marked in Metropolitan Electric Tramways ordinary was 10 days ago, at 1s. per share, the preference recording a bargain at 5s. at the same time.

Electricity Supply shares are unchanged, and amongst the manufacturing issues, General Electric ordinary at 18½ are 10s. up. India-Rubber shares are ¼ higher. British Westinghouse preference declined a similar fraction to 2 13/16. Babcock & Wilcox gave way to 3, and recovered to 3¼.

British Columbia Electric Railway 4½ per cent. debenture stock rose 4 to 55, on the expectation that, after all, the Municipality will recognise the fairness of the company's contentions with regard to competition. The preference stock is 2 better at 42½. Canadian General common stock has improved to 115, the preferred to 110½. Kaministiquia Power common is 122½ ex div. The Mexican group leans to the lower side, though the changes are comparatively small. Brazil Tractions dropped another 2, to 42, Brazilians being dull all round. The preferred remains steady about 90. Brisbane ordinary are good at 6½, and this is ex div.

It is a little unusual to have a fall to record amongst the best-class cable shares, but this week Eastern Extensions have eased off ½ to 14½. Westerns, however, are ½ up at 15¼, while Eastern ordinary at 149½ stands just between the two. Marconis are very quiet, with a dull tendency for choice. The parent shares gave way ½; Americans are tolerably steady at 21s. 6d., Canadians at half-a-guinea.

Rubber shares keep a firm market, though business has been quiet. Raw rubber is a farthing or so lower at 2s. 8½d. per lb. The armament group is good, and iron and steel descriptions are mostly better. Round the Stock Exchange generally there is not much going on, and the next developments on the Italian front are awaited with keen interest.

Stock Exchange Notice.—Application has been made to allow the following to be quoted in the Official List:—

Fraser & Chalmers, Ltd.—£100,000 6 per cent. debentures of £100 each.

City of Buenos Aires Tramways (1904) Co., Ltd.—Dividend of 1s. 3d. per share, being at the rate of 5 per cent. per annum, less tax, for the three months ended September 30th.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price Nov. 6, 1917.	Rise or fall this week	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	9	6¼	—	£6 18 6
Charing Cross Ordinary	5	5	4	—	6 5 0
do. do. do 4½ Pref.	4½	4½	3⅞	—	6 13 4
Chelsea	4	3	2⅞	—	5 9 1
City of London	8	8	1⅜	—	6 3 1
do. do. 6 per cent. Pref.	6	6	10½	—	5 18 6
County of London	7	7	11	—	6 7 8
do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	6	5½	—	5 14 3
London Electric	5	5	1	—	Nil
do. do. 6 per cent. Pref.	6	4	2½	—	5 6 8
Metropolitan	5	5	3⅞	—	4 12 4
do. 4½ per cent Pref.	4½	4½	3⅛		7 4 6
St. James' and Pall Mall	8	8	7	—	5 14 6
South London	5	5	3	—	6 13 4
South Metropolitan Pref.	7	7	11/6	—	5 19 6
Westminster Ordinary	7	7	6⅞	—	5 8 3
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	98xd	—	6 2 0
do. Def.	83 6	1½	23½	—	6 9 0
Chile Telephone	6	8	7⅞	—	5 11 4
Cuba Sub. Ord.	5	7	8(	—	*3 0 0
Eastern Extension	6	6	14½	— ½	*5 7 9
Eastern Tel. Ord.	8	8	149½	—	*5 7 0
Globe Tel. and T. Ord.	7	7	1⅛	—	*5 5 8
do. Pref.	6	6	10⅜	—	5 15 8
Great Northern Tel.	22	24	29	—	6 3 1
Indo-European	13	13	53½	—	6 3 10
Marconi	10	15	3⅞	— ⅛	4 14 0
Oriental Telephone Ord.	10	10	3⅝	— ⅛	3 4 0
United R. Plate Tel.	5	5	6½	—	*5 15 6
West India and Pan.	6d.	6d.	1/6	—	*3 9 6
Western Telegraph	7	8	15½	+ ⅛	*5 5 0
Home Rails.					
Central London, Ord. Assented	4	4	60½	—	6 12 3
Metropolitan	1	1	28	— ⅛	4 7 0
do. District	Nil	Nil	16	—	Nil
Underground Electric Ordinary	Nil	Nil	1⅞	— ⅛	Nil
do. do. "A"	Nil	Nil	6/8	—	Nil
do. do. Income	6	4	86	—1	*4 16 5
Foreign Trams, &c.					
	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	4⅞	—	6 3 1
Anglo-Arg. Trams, First Pref.	5½	5½	5	—	9 3 4
do. 2nd Pref.	6½	—	2½	—	—
do. 5 Deb.	5	5	68	+ ½	7 7 3
Brazil Tractions	4	4	42	—2	—
Bombay Electric Pref.	6	6	92	—	6 4 8
British Columbia Elec. Rly. Pfds.	5	5	42½	+2	11 18 2
do. do. Preferred	Nil	Nil	30	—	Nil
do. do. Deferred	Nil	Nil	27½	—	Nil
do. do. Deb.	4½	4½	55	+4	7 14 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	44½	—1	Nil
do. 6 per cent. Bonds	Nil	Nil	38	—1	Nil
Mexican Light Common	Nil	Nil	12½	—	Nil
do. Pref.	Nil	Nil	35	—	Nil
do. 1st Bonds	Nil	Nil	49½	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	3½	—	4 16 0
British Aluminium Ord.	7	10	1⅝	—	6 3 1
British Insulated Ord.	17½	20	3	—	6 13 4
British Westinghouse Pref.	7½	7½	2½	— ½	5 6 9
Callenders	20	20	1¼	—	6 18 0
do. 5 Pref.	5	5	⅞	—	6 1 6
Castner-Kellner	22	22	5⅛	—	6 8 0
Edison Swan, fully paid	—	—	2⅜	—	Nil
do. do. 4 per cent. Deb.	4	4	7½	—	5 7 5
Electric Construction	7½	7½	1	—	7 10 0
Gen. Elec. Pref.	6	6	10½	—	5 14 3
do. Ord.	10	10	1⅝	+ ½	5 8 9
Hewley	25	25	15½	—	7 18 8
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	14¼	+ ½	*7 1 7
Telegraph Con.	20	20	41	+1	*5 17 0

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, November 7th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/5	..
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	,,	£58	£1 inc.
a Bisulphide of Carbon	,,	£45	..
a Borax	,,	£88	..
a Copper Sulphate	,,	£86	£3 inc.
a Potash, Chlorate	per lb.	2/6	..
a ,, Perchlorate	,,	2/-	..
a Shellac	per cwt.	£13 10	£1 inc.
a Sulphate of Magnesia	per ton	£16	..
a Sulphur, Sublimed Flowers	,,	£35	..
a ,, Lump	,,	£32	..
a Soda, Chlorate	per lb.	10½d.	..
a ,, Crystals	per ton	12½/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2' to 12' basis)	per lb.	..	..
c ,, Tubes (solid drawn)	,,	..	..
c ,, Wire, basis	,,	..	..
c Copper Tubes (solid drawn)	,,	1,6½ to 1/7	..
g ,, Bars (best selected)	per ton	£150	..
g ,, Sheet	,,	£150	..
g ,, Rod	,,	£150	..
d ,, (Electrolytic) Bars	,,	£125	..
d ,, ,, Sheets	,,	£152	..
d ,, ,, Wire Rods	,,	£135	..
d ,, ,, H.C. Wire	per lb.	1/3½	..
f Ebonite Rod	,,	1/-	..
f ,, Sheet	,,	2/6	..
a German Silver Wire	,,	2/5	..
h Gutta-percha, fine	,,	6/10	..
h India-rubber, Para fine	,,	2/5½	..
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l ,, Wire, galv. No. 8, P.O. qual.	,,	£42	..
g Lead, English Pig	,,	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 4/-	..
e ,, ,, ,, medium	,,	8/6 to 6/-	..
e ,, ,, ,, large	,,	7/6 to 14/- & up	..
d Silicium Bronze Wire	per lb.	1/6½	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	,,	..	..
n ,, Wire, Nos. 1 to 16	per lb.	8/6	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Rolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Swedish Metallurgy.—According to statistics, the output of electric furnaces in 1915 was as follows:—

	Metric tons.
Iron	33,075
Ferro-silicon	11,819
Manganese ferro-silicon	2,328
Ferro-chrome	242
Ferro-manganese	957
Ferro-silicon-aluminium-manganese	785
Ferro-silicon-aluminium	346
Ferro-vanadium	4

The major part of this output is derived from the Trollhättan works. In this works the output of zinc from the electric furnace by direct treatment of the ore and scrap metal rose in 1915 to 8,588 tons, against 2,290 tons in 1914, an increase of about 273 per cent. There were in Sweden at the beginning of 1916 about ten electric furnaces ranging from 2,000 to 3,000 KW.—viz., at Domnarfvet, two furnaces of 3,000 H.P. and one of 6,000 H.P., all working; at Soderfs, three furnaces of 3,000 H.P. under construction; at Ljusne, one furnace of 3,000 H.P. under construction; at Hagfos, three furnaces of 3,400 H.P. under construction; at Trollhättan, one furnace of 2,000 H.P. working and one of 3,000 H.P. under construction. Some of these furnaces were finished in 1916, and it is reckoned that the output of electric iron will greatly exceed that of 1915. Besides these furnaces, there is a large number of steel furnaces which treat either cast or scrap iron or else refine ordinary steel; their output at present is 100,000 tons yearly. According to observations and calculations made, a complete works fitted with three furnaces of 3,000 or 4,000-H.P. capacity would cost before the war about 400,000 fr. per furnace; the working requirements of each 3,000-H.P. furnace turning out 20 tons of iron per effective working day being, per ton:—

Anthracite coal	300 kg.
Electrodes	5 kg.
Lime	107 kg.
Electrical energy	2.116 KW.-hours
Labour	3 fr.

Such a furnace would require the services of 30 men for all purposes.—*Rivista Tecnica d' Elettricità.*

THE RHODES-FIRTH COMBINED LIGHTING AND ENGINE-STARTING SET.

Among those who are devoting attention to the question of dynamos for train and motor-car lighting purposes, and to combined generators and motors for use for engine starting as well as lighting on petrol motor vehicles, are Messrs. Jos. Firth, of Windsor Road, Werneth, Oldham, and Wm. F. W. Rhodes, of Bradford, from whom we have received some particulars of their joint productions, which embody some interesting details.

Dealing first with the car-lighting generator, this is of the shunt-wound, double-pole variety, the leading feature being the method of drive adopted to secure that the dynamo shall be run at a constant speed—when a pre-determined speed of the engine or vehicle has been attained—despite the ever-varying speed of the

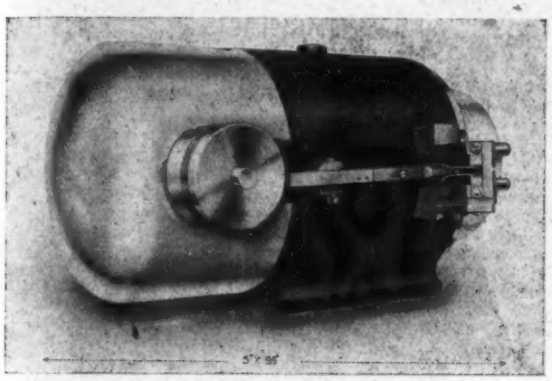


Fig. 1.—Rhodes-Firth Car-lighting Dynamo.

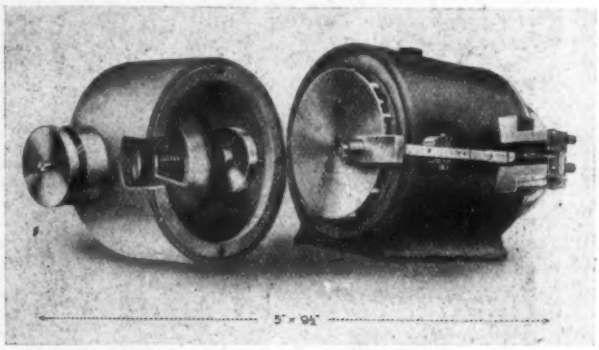
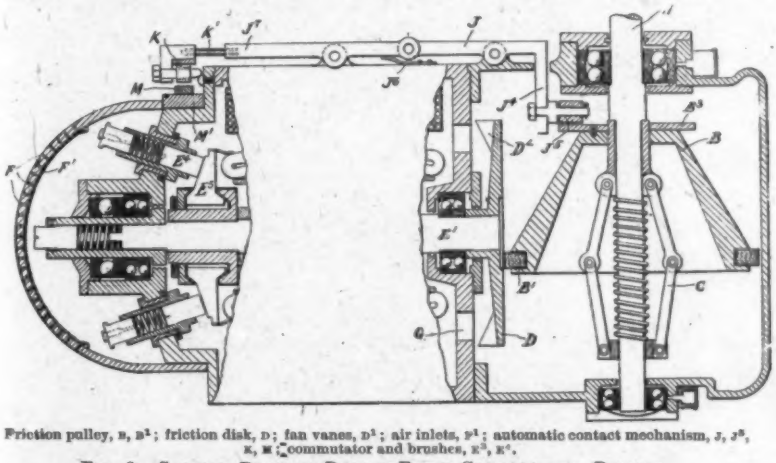


Fig. 2.—Dynamo, and Casing enclosing Friction Drive.

engine or other part of the chassis from which the generator derives its power, and so enable the current generated to be delivered to the battery at a practically constant voltage. The system of drive adopted, both for the generator in its simple form, and in the combined dynamo-motor, is indicated by the sectional plan drawing fig. 3. From this it will be seen that, mounted on ball bearings in a casing at one end of the machine, is a spindle, the outer end of which projects through the casing and terminates in a bevel gear meshing with a bevel ring fitted to the engine flywheel or other rotating part of the chassis of the car, as shown in fig. 6. The inner end of the spindle, within the casing, is provided with a friction pulley, with which is combined a spring-controlled governor of the centrifugal type, so mounted as to rotate with the shaft, and to be able to slide along it as the speed of the shaft increases or decreases. In order to allow for the compact disposition of the governor in relation to the friction driving pulley, the latter



Friction pulley, B, B^1; friction disk, D; fan vanes, D^1; air inlets, F^1; automatic contact mechanism, J, J^3, K, M; commutator and brushes, E^5, E^6.

Fig. 3.—Section Plan of Rhodes-Firth Car-lighting Dynamo.

is, as will be seen, made in the form of a truncated cone, provided at its larger end with a relatively narrow friction band which makes contact with a friction disk mounted on one end of the generator spindle. A feature of the governor spring is that it embodies provision to overcome the usual tendency of centrifugal governors to have a greater movement as the rate of revolution increases, thus adding to the uniformity of the generator speed, which in the case of the 1,500-watt train-lighting dynamo referred to further on, is claimed not to exceed 5 per cent. The friction disk on the generator spindle is made in the form of a fan that is, vanes or blades are provided on the back of the disk so that, when it is rotating, air is drawn in through holes, covered by pads, formed in the cover over the brush or commutator end of the machine, an arrangement which not only assists in preventing any undue heating of the generator, but prevents the drawing in of any dust or other impurities with the air, which passes through apertures in the generator casing and out at the opposite end of the machine to that at which it enters.

Reference may now be made to the means provided for automatically making and breaking the connection between the generator and the storage battery employed when the engine speed attains or falls below a predetermined rate. Pivotally mounted on the exterior of the generator casing is an insulated lever, one end of which passes through the casing surrounding the friction pulley and governor. On this end of the lever is mounted an anti-friction bowl or roller, so that when the friction driving pulley is in a certain position on its supporting shaft the bowl or roller engages with a collar on the upper end of the truncated cone of the friction pulley. The lever is acted upon by a suitably-disposed flat spring, which tends to keep the lever end opposite to that above referred to away from the generator casing, the lever being thus at one time influenced by the movement of the truncated cone and at other times by the spring. The outer end of the lever is attached to a flat spring, which, in its turn, is connected with a cut-out lever so situated as to be able to engage with, and disengage from a contact device of spring form, mounted on an insulated block and arranged in circuit with the battery. Thus, when the predetermined speed of the engine—or in other words, the battery-charging voltage—has been attained, one end of the lever is raised and the other lowered, the circuit between the generator and the accumulators being thus automatically completed, and, *vice versa*, broken when the engine or vehicle speed falls below a certain rate. In order to secure a quick make-and-break action between the contacts, a suitable projection is provided to act in combination with the cut-out lever. The projection holds up the movement of the contact for a brief period, irrespective of the movement of the lever operating it, the resulting lag ensuring that the make or break, when it occurs, shall be practically instantaneous, any "arcing" or burning of the contacts when coming into or out of action being at the same time avoided. It may be added that the generator is provided with a disk commutator in combination with spring brushes, their form being such as to render more positive the contact between the driving and driven friction surfaces already mentioned.

As will be seen from the general views figs. 1 and 2, one of the features of the machine is its compactness, the 6-volt, 150-watt dynamo, including the casing containing the friction drive, measuring only 5 in. by 9½ in., this being a point of importance in motor vehicles where it is extremely desirable that the installation of a lighting dynamo shall not interfere with the accessibility of any of the component parts of the engine or chassis. Another important factor is that of the weight, the machine illustrated, which is claimed to have a minimum overall efficiency of 67 per cent., being only 16¼ lb.

As already indicated, Messrs. Rhodes and Firth have also adapted their constant-speed friction drive to a combined dynamo-motor for engine-starting as well as lighting purposes on motor vehicles. The double-purpose machine is driven as a generator in the manner already described; to enable it to be used as a starter, however, the machine spindle, in addition to carrying on its extremity a driven friction disk, is also provided with a small bevel pinion (C, fig. 4) which meshes with a bevel crown wheel, C 1, secured to the lower, wide end of the truncated cone which carries the friction driving band. In this way a positive drive is, for engine starting purposes secured, the gear ratio being 4½ to 1. When used as a starter the centrifugal governor is automatically put out of action by a locking device—not shown in any of the accompanying drawings owing to the fact that the necessary patents are not yet issued—so that the truncated cone is held stationary, as to its position thereto, on its shaft. The locking device is arranged to remain in action until the engine has been set in operation and has attained

from ¼th to ⅓rd of its maximum speed, when it automatically releases the governor, so allowing not only the disengagement of the bevel gear, but the friction drive of the dynamo to come into

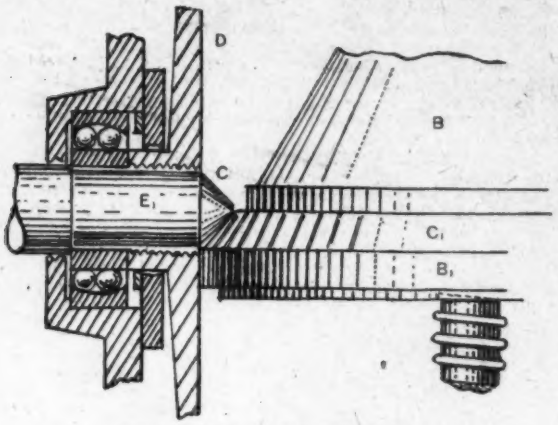


Fig. 4.—Engine-starting Device.

operation. When the engine is at any time stopped, the friction drive spindle, under the action of the governor, automatically lowers, so bringing the bevel gears into engagement ready for the

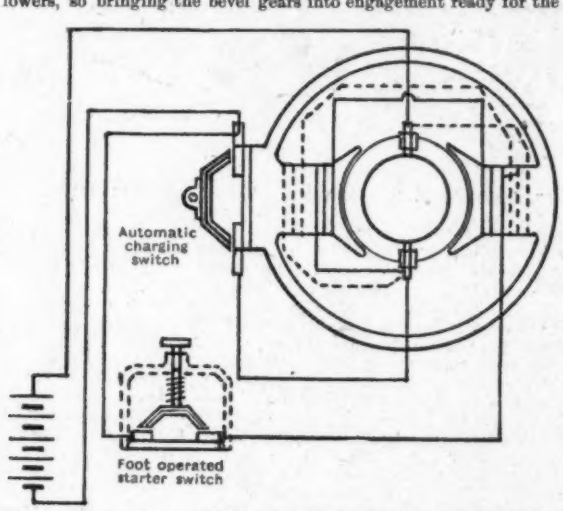


Fig. 5.—Generator-motor Connections for Engine Starting.

next start-up. The combined generator-motor is made to work at a pressure of 12 volts and has a capacity of 250 watts, the gross weight being 28 lb. The ratio of governor speed as a generator is

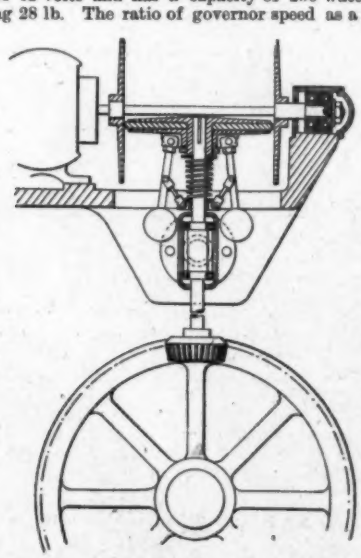


Fig. 6.—Rhodes-Firth Train-lighting Dynamo with Double Friction Disk.

3½ to 1, while, when used as a motor or starter, the machine is claimed to be capable of giving a starting torque equal to ¾ B.H.P. The minimum efficiency as a generator is stated to be 72 per cent., and as a motor 76 per cent. A diagram of the connections when the machine is used as a starter is given in fig. 5.

For train-lighting purposes, the same method of drive as indicated in fig. 3, is adopted, the principal variation being the provision made to enable the dynamo to be driven in a constant direction whether the train is running either forwards or backwards. In this case, the extention of the generator spindle carries two friction-driven disks either of which may be automatically engaged by the friction driving band, according to the direction of running of the driving shaft, by reason of the "pull" exerted by the gear wheels forming the drive on a swivel joint which, as shown in fig. 6, is provided in conjunction with the friction driving band spindle. The train-lighting set has a capacity of 1,500 watts, the gross weight being 200 lb.; the ratio of governed speed is 10 to 1, the variation of speed of the generator spindle being, as already mentioned, claimed not to exceed 5 per cent., and the variation of pressure not more than 8 per cent.

GERMAN ECONOMIC ORGANISATION.

The following important quotation from the *Board of Trade Journal* may to some extent explain the very emphatic advice which has recently been given by representatives of the Government Department of Commercial Intelligence with respect to the need for co-operation and combination amongst British manufacturers :—

"The *Neue Zürcher Zeitung* follows up its review of the progress made in industrial discoveries and processes in Germany during the war, with a review of the progress accomplished in the field of economic organisation in that country in the same period. The chief characteristic of the third year of war has, it is said, been the tendency towards compulsory and voluntary syndication of industrial concerns. Compulsory syndication has been demanded by the Government to secure economy in view of the scarcity of material and the shortage of labour; while voluntary syndication has been suggested and carried out by the parties interested, by way of preparation for the prospective economic war, and in order to facilitate the return of peace conditions in the economic sphere, though in some cases this action has been in response to suggestions and hints on the part of the Government. This was the case with the renewal of the coal syndicate, in which all mining firms hitherto remaining outside are now included. The sole reason for the smooth progress of the negotiations was the threat of compulsory syndication in the event of non-agreement.

"The great union in the chemical industry, on the other hand, has been voluntary. This combine, which is for a period of fifty years, is primarily of a defensive nature. The constituent works retain complete independence and freedom of action, but profits will be pooled, all manufacturing experiences exchanged, and all products produced in at least two places. This arrangement, it is hoped, will do much to further the exploitation of new discoveries and to promote technical progress, with the result that the position of the German chemical industry in the world market will be strengthened.

"Agreements with the same object have recently been made between the dyeing and explosives groups of industries. The same tendency is observable in the central combines of the German wholesale trade, the shipping trade, &c., which have arisen during the third year of the war, and also in the efforts now being made towards the further syndication of numerous small industries, *e.g.*, the rope, leather, iron small wares, and enamel industries. The pooling tendencies do not, however, meet with approval everywhere. In the leather industry, for instance, there is keen opposition between the heavy branches, which are in favour of a trust, and the fine branches, which are against it.

"In the iron industry, syndication proceeds slowly but surely, and not without official support. Efforts are now being made to re-establish the rolled wire combine, which was dissolved soon after the outbreak of war. Altogether the syndicate idea has gained ground in the by-products industry much more quickly and distinctly than had been expected. But it is not probable that all the recently-formed syndicates will continue after the war, unless Government action is taken to ensure that they should continue, at any rate for the transition period, in the interests of national economy

"In addition to the combines properly so-called, there have been numerous amalgamations and fusions of individual concerns, which are further evidence of the general tendency towards the development of large organisations in German economic life. Numerous individual men of business are retiring into private life, their places being taken, as a rule, by large companies and combines. This concentration has been further promoted by measures taken or proposed within the States, such as the proposal to tax turnover. Were such a proposal carried into effect, it would probably give a great advantage to the large enterprises which carry on the whole range of production from the raw material to the finished product, so that the turnover is not subject to frequent charges. Such measures have brought about a similar concentration in trade, as they have resulted in many liquidations of smaller firms.

"The role played by the banks in these fusions, amalgamations, and absorptions is much less important than in peace time: first, because the undertakings in question have as a rule made such large war profits that they can dispense with the assistance of banks; and, secondly, because the banks themselves are undergoing a process of concentration, which is, however, being carried on below the surface. The chief reason for this tendency towards concentration is that the problems confronting German finance on the conclusion

of peace (the problems connected with supplies of raw materials, resumption of issue, reconstruction of credit organisation, &c.) can be accomplished only by institutions of extraordinary capacity and internal strength. The result of this must perforce be a further reduction in the number of medium-sized houses."

LEGAL.

ABRAHAM *v.* ALLIED MANUFACTURERS' GUILD, LTD.

IN the City of London Court, on November 1st before his Honour Judge Atherley-Jones, K.C., Victor Abraham, Bayswater, sued the Allied Manufacturers' Guild, Ltd., 24, Coleman Street, E.C., for £84, for two weeks' salary at £4 a week, and damages for breach of agreement.

Mr. Clements appeared for the plaintiff, and Mr. Mayne, defendants' managing director, defended.

It seemed from the plaintiff's case that he was employed as defendants' manager at Moorgate Hall, at a salary of £4 per week, and he had to take up £100 worth of shares in the defendant company at the outset. The £100 was to be refunded if the company went into liquidation, and within 12 months when he left their service. Plaintiff declared that defendants wanted to alter the payment of his salary from weekly to monthly, and then they would not, or could not, pay him at all. That, he urged, put an end to his contract, and he demanded damages. Defendants denied that they had put an end to the contract. They never refused to pay him his money. The Guild was formed to develop trade in electrical goods between England and the allied and neutral countries, to stop dealing in German goods. They co-operated with manufacturers to that end. Plaintiff undertook that class of work, but, owing to import and export restrictions, the company could not get an income. Plaintiff's services were practically of no use to them. He agreed to take his salary monthly.

JUDGE ATHERLEY-JONES said plaintiff had no right to assume that he would not get his salary. There had been no breach by the defendants. Plaintiff would get the £8 paid into Court as wages, but no more. Judgment accordingly.

WAR ITEMS.

Cancelling German Contracts in Brazil.—A Reuter dispatch from Rio de Janeiro states that the Foreign Committee of the Chamber has authorised the Government to cancel all contracts entered into with Germans.

Ministry of Reconstruction.—The Minister of Reconstruction has appointed Mr. Vaughan Nash, C.V.O., C.B., and Mr. G. H. Young, C.B., to be joint secretaries to the Ministry of Reconstruction.

Russian Industrial Demobilisation.—The "Times" states that delegates representing mobilised industries of Russia have decided at a general meeting to begin the preparation for industrial demobilisation.

Unscreened Lights.—Vernon Lovegrove, electrician at the Cold Storage of the Port of London Authority in Charterhouse Street, E.C., was fined £10 at the Guildhall on Saturday for leaving unscreened lights on the top floor of the premises on October 24th.—*Times.*

Ball Bearings.—The Minister of Munitions has made an Order under the Defence of the Realm Regulations forbidding the manufacture after November 1st of ball bearings or roller bearings without a licence. He has also prohibited on the same conditions the sale of ball bearings in this country and the purchase of them outside the United Kingdom. Manufacturers may be called upon to make returns of their stocks. Applications for licences may be addressed to the Director of Ball Bearings, T.M.3, Ministry of Munitions, Whitehall Place, London, S.W.1.—*Times.*

The F.B.I. and Italy.—Sir R. Vassar Smith, Bart., president of the Federation of British Industries, has sent the following telegram to Signor Orlando, the Premier of Italy:—

"The Federation of British Industries extends its full sympathy to the Italian Army and nation in the present crisis, and pledges its members, whose joint capital represents over 2,000 million sterling, and who employ some 3,000,000 workpeople, to stand unreservedly behind the British and Allied Governments in furnishing to Italy any support which they may deem necessary."

Building Materials.—The Minister of Reconstruction has appointed a committee to consider and report upon the question of the supply of building materials after the war. They will collect information as to the probable demand for such materials and the availability of supplies, also how the latter may be increased, and the effect of such increase upon price, also the principles and methods by which the priority of various claims should be settled. They will report what steps are necessary to facilitate the prompt commencement of building work at the cessation of hostilities, and will make recommendations as to any measure of control that may be necessary in regard to charges, production, transport, or distribution of material. The matter is in the hands of the Buildings Materials Supply Committee, Ministry of Reconstruction, 2, Queen Anne's Gate Buildings, London, S.W.1.

French Electrical Anti-German Propaganda.—We have before us copies of an illustrated leaflet which is being distributed in Paris by the Ligue Nationale de Defense des Interets Francaise. Translated the circular reads in part as follows:—

"To you who used to buy apparatus, material, and electric fittings from German firms, Siemens & Halske Aktien Gesellschaft, Wernerwerk, Berlin-Nonnendamm (Preussen, Deutschland), and Siemens Schuckert, Gesellschaft mit beschrankter Haftung, Siemens-Stadt bei Berlin (Preussen, Deutschland) through their representatives in France, . . . be it known that these German firms show you their gratitude by manufacturing shells now for killing or mutilating daily French officers and soldiers, your sons, brothers, relations, and friends." An illustration is reproduced in the circular of a shell fuse picked up by "one of our gallant soldiers in Champagne." "The trade-mark 'S.H.' stands out most clearly, and it is the duty of every Frenchman henceforth to exclude this trade-mark rigorously from France."

"A.E.G., Société Française (.) d'Electricité, Société Anonyme. Représentation générale de la Allgemeine Elektricitats Gesellschaft, Dorotheen-Strasse, No. 40, Berlin, N.W. 7 (Preussen, Deutschland); Paris. Agencies at Caen, Lille, Lyons, Marseilles, Nancy, Nice, Toulouse. Board of Directors: President, Mr. Deutsch. Members, Messrs. P. Mamroth, Thurnauer, Burrell, Roos Koch. Managing director, Mr. Koch. Auditors, Messrs. Guéroult & Pfeffer."

An illustration is here reproduced of a shell fuse picked up at Avocourt, "on the battlefield before Verdun (May, 1916) by Lieut. Copen, Knight of the Legion of Honour, slain by the enemy in August, 1916. Notice how these three letters A.E.G., trade-mark of this German firm, stand out plainly on the fuse, clearly justifying the charge so often made that the only true 'industry' of Prussia and Germany is war. The least we owe to the memory of our fellow-countrymen who have fallen is to shut out from France for ever this detested trade-mark."

Exemption Applications.—The Military appealed against exemption to January 31st (or until a substitute was found) given by a Local Tribunal to L. W. Cornish, Exeter (21, single), B 1, acting shift engineer at Exeter Corporation electricity works. It was urged that three shift engineers, each working eight-hour shifts, were essential at the works. The Military Representative said he had made an offer to Mr. H. C. Munro, city electrical engineer, to consent to Cornish being given six months' exemption, with leave to apply again, provided Mr. Munro did not appeal for Benson, another engineer, a younger man in Class A. Mr. Munro agreed, and the Tribunal approved.

Application was made to the Fulham Tribunal for the exemption of an electrical and mechanical engineer, aged 32, married, employed by the British Vacuum Cleaner Co. It was stated that the man was engaged practically the whole of his time on Government work, and was responsible for the repair of all machinery. He was the only engineer left to the firm, and was more or less at the call of the Government. Subject to military training, four months' exemption was granted.

At Barnsley, the Electric Traction Co., Ltd., appealed for 15 employés, the whole of whom were conditionally exempted.

On the recommendation of the Advisory Committee, Rochdale Tribunal has granted temporary exemption until March 31st to J. T. Hoyle (34, B 1), controller cleaner and examiner, appealed for by the Corporation Tramways Committee.

With the assent of the Military, three months have been allowed to A. Deahl (40), electrician, and E. G. Durdle (40), dynamo attendant, engaged at Brookwood Asylum, Woking.

Kidderminster Tribunal has granted exemption until March 31st to E. Turner (37, Class A), car-shed foreman, and A. E. Jackson (37, B 1), motorman.

At Ilfracombe, the Tribunal adopted a recommendation by the Advisory Committee giving temporary exemption until April 1st to A. H. Friend (33, C 3), electrical engineer.

At Tunbridge Wells, an electrical engineer appealed for two electric light wiremen. The Military Representative said that there were nine men engaged in this work in the town, and that these two men previously held protection certificates. Mr. S. A. Cheale (a member of the Tribunal) suggested that lads of 17 could do many of the jobs, but the employer declared that lads could not do nine out of ten such jobs. One of the men was refused exemption, with grace until January 1st, and the other was exempted until a suitable substitute is found.

Epsom Rural Tribunal has granted three months' exemption to W. West, electrician, of Cobham.

Before the Cumberland Appeal Court, the Carlisle Tramway Co. appealed for the traffic inspector, H. Shrubsole (32, Class A), the only inspector left, and stated to be working from early morning to late at night. Most of the old drivers had gone, and it was represented that the staff needed a great deal more looking after than formerly. In reply to questions, it was stated that the company had no female drivers; the

Corporation would not licence them. The appeal was dismissed.

At Southwark, F. J. Leach, 22, an electrical sub-station attendant, was summoned at the instance of the Military Representative to show cause why his conditional exemption certificate should not be withdrawn. He did not attend, the Clerk stating that he had received exemption through the Metropolitan Railway Co. Coun. King said it was outrageous that exemption should be granted to a single man, who probably was fit for general service. The Clerk said the Tribunal had no power in a case like this, as an arrangement had been come to between the Government and the railway company. The conditional exemption certificate was withdrawn.

Messrs. Paice & Endicott, electrical engineers, of Southwark Bridge Road, applied for the exemption of a metal polisher, 34, fit for garrison duty abroad (B 1), whose wages averaged £3 a week. He was engaged entirely on Government work, grinding and polishing spare parts for munition factories. They held certificates under the Protected Trades' Schedule for three men, but had not been granted one for this man. The Military Representative said the protected trades' certificate was the real test of the man's work. Was he essential to the firm's output? The firm's manager replied that he was. The Military Representative: Then why have you not pressed for a certificate? The manager replied that they had pressed for one, but they had received a letter from the Ministry of Munitions stating that they could not grant this man a certificate under the schedule until the claim for exemption was disposed of by the Tribunal. The Military Representative said on that letter the applicants had not lost their final application for a protection certificate. The Tribunal appeal must first be disposed of, for the Ministry of Munitions did not know on what grounds his exemption there was granted. He might have got it on domestic grounds, but now the claim must be dealt with under the schedule. A month's final exemption was granted, the firm being referred to the M.A.R.O. for further protection.

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

15,302. "Electric switches for lighting and ignition for aeroplanes, motor cars, &c." E. J. Brothers. October 22nd.

15,304. "Electric flashlamp walking-stick and umbrella." B. C. Hills. October 22nd.

15,314. "Electric hand lamps." F. A. Buley & J. W. Treherne. October 22nd.

15,316. "Induction motors." British Thomson-Houston Co. (General Electric Co., U.S.A.) October 22nd.

15,330. "Galvanometers." T. Clark & J. May. October 22nd.

15,348. "Insulation of electric conductors." L. B. Atkinson. October 22nd.

15,351. "Resistances for use in heating liquids electrically." J. F. Barr. October 22nd.

15,369. "Electric trams, &c., propelled by overhead wire." R. D. Bailey. October 23rd.

15,383. "Adjustable electric fittings of the pendant type." J. M. Coplan. October 23rd.

15,393. "Ovens and hot cupboards heated by electricity, steam, oil, or gas." F. P. Fletcher. October 23rd.

15,394. "Systems of electrical transmission." British Thomson-Houston Co. & General Electric Co. October 23rd.

15,402. "Method of removing tubes deposited by electrolysis upon mandrels." T. F. Newman. October 23rd.

15,404. "Electric clocks." W. G. Kent & L. W. Pullman. October 23rd.

15,415. "Electric controllers for direct-current motors for works, cranes, travellers, charges, &c." J. Geary & W. Geary. October 23rd.

15,419. "Electrical switches, links, fusible cut-outs, &c." C. J. Baker, Karteret Engineering Co. & V. G. Middleton. October 23rd.

15,425. "Machines for making electrodes for batteries." S. L. Casella. October 23rd. (U.S.A., December 7th, 1916.)

15,431. "Means for cooling electric motors." E. Harris. October 24th.

15,445. "Generating coal gas in electrically-heated retorts." J. Walster. October 24th.

15,464. "Aerial circuits for wireless telegraphy, &c." R. A. W. Watt. October 24th.

15,488. "Radio telegraphy or telephony." Soc. Francaise Radio-Electrique. October 24th. (France, October 24th, 1916.)

15,505. "Electric muffles." W. F. Jones. October 25th.

15,514. "Electrical make-and-break contact." J. H. Potts. October 25th.

15,541. "Electric accumulators." E. A. Cotte. October 25th. (France, October 25th, 1916.)

15,543. "Audion or lamp relays or amplifiers for wireless telegraphy and telephony." M. Latour. October 25th. (France, October 23rd, 1916.)

15,583. "Automatic arc lamps." W. Engelke. October 26th.

15,610. "Wireless signalling systems." J. H. Rogers. October 26th. (U.S.A., November 10th, 1916.)

15,611. "Wireless signalling systems." H. H. Lyon. October 26th. (U.S.A., November 10th, 1916.)

15,612. "Dynamo-electric machines." Enclosed Motor Co., H. C. E. Jacoby & P. A. H. Mossay. October 26th.

15,629. "Apparatus for electrolytic production of zinc, copper, &c." Soc. de Metallurgie Electrolytique. October 26th. (France, October 28th, 1916.)

15,635. "Electric light apparatus." N. Papa. October 26th.

15,670. "Electrical regulating apparatus." B. Davies, Eastern Telegraph Co. & W. Judd. October 27th.

15,688. "Electric switches for motor cars, &c." P. O. Dorer, R. H. Rogers & S. Smith & Sons. October 27th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

5,237. Automatically-controlled Electric Water and Other Heaters. C. S. Forbes. October 10th, 1916. (109,979.)

10,855. Electric Lighting and Heating of Railway or other Vehicles. C. H. Vidal. August 1st, 1916. (Addition to 19,977/14.) (109,985.)

12,986. Electrical Wave Transmission. M. I. Pupin & E. H. Armstrong. September 17th, 1915. (101,541.)

12,987. Wireless Systems and the like. M. I. Pupin & E. H. Armstrong. October 1st, 1915. (101,702.)

12,988. Transmission of Electrical Signals. M. I. Pupin & E. H. Armstrong. February 10th, 1916. (104,158.)

13,707. Electric Switches. A. Crawford & W. Preston. September 27th, 1916. (103,992.)

13,813. Manufacture of Alkaline Peroxide. G. F. Jaubert. October 2nd, 1915. (101,709.)

13,934. Production and Utilisation of Magnesium Chloride. G. H. Bailey, G. W. A. Foster & British Aluminium Co. September 30th, 1916. (109,996.)

14,027. Magnetic Compasses." F. Barker & Son and E. W. Barker. October 3rd, 1916. (110,002.)

14,031 Wireless Electric Circuit Controlling Apparatus. M. Inoue. May 11th, 1916. (106,266.)

14,109. Flash Lamps. S. Peplow & F. N. Hepworth. October 4th, 1916. (110,014.)

14,113. Swivelling Electric Couplings. J. D Shaw. October 4th, 1916. (110,018.)

14,690. Electrolysing Apparatus. R. J. J. Mueller & Universal Oxygen Co. October 16th, 1916. (110,036.)

14,927. Electrical Cut-out or Distribution Board. R. W. Bill. October 20th, 1916. (110,038.)

15,153. Electric Radiant Heat Fire. H. S. Ellis & J. C. Petersen. October 25th, 1916. (110,039.)

16,005. Means for Relay Transmission of Directive Angular Movements. R. E. Gillmor (Sperry Gyroscope Co., U.S.A.) November 8th, 1916. (110,046.)

17,060. Latching Devices in connection with Alternating-current Electromagnets. Akt. Ges. Brown, Boveri et Cie. January 10th, 1916. (103,640.)

17,588. Electric Discharge Tubes. British Thomson-Houston Co. (General Electric Co., U.S.A.) December 7th, 1916. (110,057.)

18,174. Formation of Joins in Iron and Steel Piping. Quasi-Arc Co. and W. L. Cole. December 19th, 1916 (110,065.)

18,509. Electrical Transformers. A. G. Ellis & J. L. Thompson. December 27th, 1916. (110,070.)

1917.

691. Casings for Telephone Receivers. H. W. Dover. January 13th, 1917. (110,076.)

802. Cord Grips for Electric Lampholders. C. G. M. Bennett. January 16th, 1917. (110,078.)

6,239. Valves. British Westinghouse Electric & Manufacturing Co. June 5th, 1916. (106,996.)

8,908. Means for Varying Electric Resistances. C. R. Hough. June 21st, 1917. (110,128.)

New Norwegian Carbon Factory.—A U.S. Consular report states that the A/S Norske Elektrodeverker is erecting a new factory at Frederikstad for the manufacture of carbon and graphite electrodes. The plant's capacity is 4,000 tons of carbon or 1 000 tons of graphite electrodes a year. It is expected to be in full operation by the end of December, 1917.

The same general standards and sizes of graphite electrodes are to be manufactured as those used throughout the United States, while the carbon electrodes run in very large sizes; most of them are rectangular in section, after a European style, the most common size being 15½ × 7½ in. Carbon electrodes will be the first product to be turned out. American engineers and machinery experts have been engaged to conduct the work of the factory, in which the machinery is to be almost exclusively of American manufacture.

The Norske Elektrodeverker has contracted to supply the demands of several Norwegian firms for electrodes, all such contracts providing that the prices named therein shall be subject to change to conform with any rise in the market prices of raw materials. This clause in contracts is made necessary, it is explained, by reason of the vast advances in price to which almost any commodity is subject in Norway in these times. The standing orders which this company now has in hand are said to be sufficient to ensure the profitable disposital of the factory's output for some time, but it is believed that by February 1st, 1918, the management will be in a position to accept general orders from Norwegian firms for delivery within a reasonable time.

The factory is working in co-operation with the Norwegian Government, and the Royal Department of Industrial Supplies has promised to facilitate the provisioning of the company with sufficient raw material for the successful operation of the plant. The Government will have the first call on the company's finished product whenever electrodes are required for Governmental uses.

Permission to receive anthracite from the United States has been granted to this company by the British authorities, upon the usual assurances that its products are not to be disposed of to nations hostile to the cause of the Allies.

The Norske Elektrodeverker has contracted to be regularly supplied with 4,500 B.P. by the Hafslund A/S, one of the three largest power companies of Norway, which derives its power from the Sarpsfall on the Glommen River. In anticipation of its present plant becoming inadequate and the necessity of erecting a branch factory, the Norske Elektrodeverker has purchased the rights to the entire power to be derived from a waterfall on the west coast of Norway, near Kristiansund.